

**REQUEST FOR PROPOSAL #98-069**  
[(Revised per Addenda No. 1 (April 2, 1999) & No. 4 (June 11, 1999)]

# **Central Puget Sound Regional Fare Coordination Project Smart Card System Procurement**

## **Volume 2 of 2** **Division III: Equipment Specifications** **Appendices A-H**



**KING COUNTY**

**Issue date: February 16, 1999**

This Proposal is funded in part by the Federal Transit Administration (FTA).  
Neither FTA nor the Federal Government are party to obligations or  
liabilities with the Contractor.

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**Community Transit**

Pierce Transit

**Everett Transit**

Sound Transit

**King County**

Washington State Ferries

**Kitsap Transit**

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### 6.III-1 GENERAL TECHNICAL REQUIREMENTS

The General Technical Requirements shall be applicable to all RFCS equipment, unless more specific subsystem specifications are provided in the subsequent Sections.

#### 6.III-1.1 Physical and Materials Requirements

- (a) All equipment shall be designed with the greatest attention to ergonomics, reliability, efficiency, and safety for passengers, operators, maintenance personnel and other system users.
- (b) Equipment furnished under these specifications shall be the latest model in current production, as offered to commercial trade, and shall conform to quality workmanship standards and use materials consistent with transit industry requirements.
- (c) The successful Proposer shall represent that all equipment offered under these specifications is new.
- (d) Used, shopworn, demonstrator, prototype, re-manufactured, reconditioned, or discontinued models are not acceptable.
- (e) All external screws, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material; no self-tapping screws shall be used unless specifically approved.
- (f) All parts shall be made of corrosive resistant material, such as plastic, stainless steel, anodized aluminum or brass.
- (g) Equipment shall be designed to prevent unauthorized access, and to facilitate authorized access.

#### 1.1.1 ADA Requirements

All equipment and devices shall comply with the requirements of *49 CFR Parts 27, 37, and 30* as amended through the date of this Contract, implementing the provisions of the Americans with Disabilities Act (ADA) of *1990*, as amended.

#### 1.1.2 Modular Design

- (a) The Contractor shall utilize modular design throughout.
- (b) Standard, commercially available components shall be used wherever possible.



- (c) All functionally identical modules, assemblies and components shall be fully interchangeable between all equipment acquired under this contract.
- (d) All modules and assemblies shall be connected using standardized durable, positive-locking, indexed quick disconnect fasteners.

### **1.1.3 Upgradeability**

All equipment shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to reconfigure I/O options, or to maintain compatibility with ISO 14443 standards as they are developed and adopted.

### **1.1.4 Vandalism**

Contractor shall include provisions to protect all equipment and components from common vandalism and physical abuse by individuals wielding portions of their body, or wooden or metallic implements.

## **6.III-1.2 Software Requirements**

### **1.2.1 General Software Requirements**

- (a) All software shall be written in a common and well-known modern high-level, highly structured language.
- (b) All software shall be the current version in production at the time of installation. Software versions to be approved by the Project Manager.
- (c) All software shall contain version control numbers.
- (d) Features shall be provided to identify the software version on each device, and verify that it is the correct or most recent version for that device.
- (e) All use of assembly/machine language shall be submitted for review and approval during the design review.
- (f) Software shall be organized in a modular, table-driven fashion to the greatest extent possible.
- (g) Adjustable, Agency specific and customization parameters shall not be hard-coded onto the source-code; they shall be user-modifiable.

- (h) Application software (both user and system) shall be portable, i.e. the source code shall be transferable to other computers using the same operating system without any modifications.
- (i) The application software shall be scaleable to newer, higher performance hardware or operating systems.
- (j) The application software design shall be developed using structured software development methods (to be approved by the Project Manager), and shall be submitted for the design review.
- (k) The system shall contain all supporting software required to implement, operate, modify, and maintain all graphics displays and interactive screens.
- (l) Passwords shall not be displayed on Video Display Units.
- (m) All software shall be self-diagnostic.
- (n) All source code shall include application and individual module descriptions.
- (o) All user and system interfaces shall have online help features.
- (p) The operating system should be standardized for all systems and Year 2000 operability must be provided.

### 1.2.2 National Architecture Conformance

- (a) All software and interfaces developed shall conform with the Intelligent Transportation Systems (ITS) National Architecture, and emerging Transit Communication Interface Profiles (TCIP). Information on the National Architecture can be found at <http://www.its.dot.gov/archconsis/iguidanc.htm>
- (b) The Contractor shall prepare and submit for review and approval a National Architecture Conformance Plan (CDRL 18), including at a minimum the following:
  - i. Elements of the RFCS affected
  - ii. Applicable standards
  - iii. Description of approach to compliance

### 6.III-1.3 System Security

The Contractor shall develop a comprehensive System Security Plan (CDRL 5) which identifies the system elements which require protection, and identifies mechanisms, procedures and processes to counter security threats to those elements.

- (a) The System Security Plan shall describe the intended functionality for each of the system security elements, shall identify security threats, and shall describe procedures, functions and systems for detecting and mitigating those threats.
- (b) The System Security Plan shall identify system users, and describe rules that govern how those users will have access to system data, resources and processes.
- (c) The System Security Plan shall identify methods of detecting security breaches regardless of whether there is a detectable change in the performance of the system. All security breach detections shall be confidential, and accessible only to users with appropriate access permission.
- (d) Security provisions for owned and non-owned communications networks shall be described.
- (e) The System Security Plan shall be submitted with the design documentation.
- (f) The System Security Plan shall be approved by the Project Manager.
- (g) The Contractor shall implement system security services to achieve the approved System Security Plan.
- (h) The Contractor shall be responsible for providing security for RFCS equipment regardless of existing security facilities and systems provided by the Agencies or others.

### **1.3.1 System Elements and Protection**

- (a) At a minimum, the system security shall protect the following types of RFCS system elements:
  - i. Equipment and facilities installed in public locations.
  - ii. Equipment and facilities installed in Contractor-owned or operated locations.
  - iii. Equipment and facilities installed in Agency-owned facilities.
  - iv. Software source and compiled code.
  - v. Data communications and interfaces.
  - vi. Other communications and interfaces as might be required for the work.
  - vii. System data.
- (b) The Contractor shall coordinate with each Agency to develop system security elements and procedures that function with existing Agency firewalls.

### 1.3.2 System Security General Services

At a minimum, the system security shall provide the following types of services:

- (a) All RFCS systems, subsystems and devices shall allow only authorized users access.
- (b) The system shall provide access control based on the establishment of groups, users and roles:
  - i. Groups, users and roles shall be assigned during system implementation as directed by the Project Manager.
  - ii. A minimum of ten (10) groups shall be provided for.
  - iii. Each user shall have a unique identification and password.
  - iv. The system shall include flexibility to add new groups, roles and users, redefine groups and roles, and reassign access permission as part of normal system operations. Access permission shall be assigned by the System Administrator.
- (c) All system access shall be recorded.
- (d) The system security shall include features to limit the propagation of access permission.
- (e) For all data transactions, the system security shall include authentication features to verify that all claimed source, recipient or user identities are correct and valid.
- (f) All data transactions shall include non-repudiation features to verify message content, and resolve claims that data was not correctly originated or received by a certain user.

#### 1.3.2.1 Protection from Unauthorized Access

As a minimum, the system security shall provide protection from intentional or accidental unauthorized access including the following:

- (a) Physical access to equipment or facilities.
- (b) Access to Contractor provided computing systems and software.
- (c) Access to Agency computing systems and software.
- (d) Access to funds, accounts and funds-related data, owned and non-owned.

- (e) Destruction, removal, corruption or modification of data or other resources.
- (f) Interruption of service, including as a minimum component, device, subsystem or system operation, and system communications.
- (g) Access to any system stored or created data.

#### 1.3.2.2 Data Integrity

The system security shall provide features to maintain data integrity, including as a minimum:

- (a) Error checking shall be provided.
- (b) Data transferred from a device or system shall not be purged or written over until a successful transfer is confirmed.
- (c) Features shall be provided to ensure that all transaction and system-created files are uniquely identified, and that no files are lost or missed during data transfer. Verification features shall be provided to confirm that there have been no losses of data at any point in the system.
- (d) Verification features shall be provided to confirm that there have been no unauthorized changes to or destruction of data.
- (e) Features shall be provided to automatically detect, correct and prevent the propagation of invalid or erroneous data throughout the system.

#### 1.3.2.3 Data Confidentiality

- (a) The following types of confidential data shall be maintained in the system:
  - i. Transaction data related to an individual Agency, employer or other system user
  - ii. Personal information on cardholders
  - iii. Revenue and other system-confidential data.
- (b) The system security shall include the following minimum data confidentiality features:
  - i. Features to prevent access to personal or other confidential data by unauthorized users

- ii. Features to prevent unauthorized association of a user identity with user-specific activities
- iii. Recording and audit of actions taken by that user.

### 1.3.3 Security Mechanisms

The Contractor shall identify and document the specific mechanisms to be used to implement the system security services in accordance with the plan. At a minimum, the following information shall be provided.

- (a) For non-cryptographic mechanisms:
  - i. Identification of the security devices for equipment and personnel.
  - ii. Description of access control for applications.
  - iii. Description of the secure routes for the transmission of data and resources.
  - iv. Participants certification process.
  - v. Trusted hardware and software components.
  - vi. Security access process as granted by defined roles.
- (b) For cryptographic mechanisms:
  - i. Description of encryption, including symmetric (private key) and/or asymmetric (public key), for confidentiality.
  - ii. Description of the hash functions for message integrity checks.
  - iii. Description of the digital signatures for authentication and non-repudiation.
- (c) For cryptographic support mechanisms of keys:
  - i. Generation, distribution and archiving.
  - ii. Directories and certification.
  - iii. Recovery/escrow.

### 1.3.4 Alarms

- (a) As a minimum, the system shall provide the following alarms, and shall notify the appropriate users in the event an alarm is triggered:
  - i. Detection of invalid or erroneous data.
  - ii. Detection of a security breach.
  - iii. Detection of a device or system fault.

- (b) All alarms shall be recorded and stored in a database, along with a history of corrective actions.
- (c) Users with associated privileges shall be able to manually override alarms.
- (d) Alarms that are manually overridden shall reactivate at a user-defined period until corrective action is taken and the alarm cleared.

#### 6.III-1.4 Data Backup and Recovery

- (a) The Contractor shall provide an alternate means of extracting data from RFCS equipment subject to Project Manager review and approval. (CDRL 7)
- (b) The backup system shall be used primarily to upload captured transaction data from the device to the clearinghouse system.
- (c) It shall be possible to recover and upload data files in the event of a primary data storage failure through a secondary standardized PC interface such as an RS 232 port.
- (d) In the event of a primary data storage failure and/or backup data storage battery failure, an indication on the display shall alert the clearinghouse system.
- (e) Correct password entry shall automatically enable RFCS device to download the transaction data to the back-up device.
  - i. Neither the RFCS equipment nor the backup device shall capture the correct password.
  - ii. Unsuccessful attempts to enter the password shall be logged.
  - iii. The log shall contain detailed information, including the date, time, location, RFCS equipment number, and erroneous password.
- (f) An alternate process for initiating data extraction and/or alternate means of removing data records may be provided which shall be subject to Project Manager review and approval.
- (g) The Contractor shall provide a detailed description of alternate process for initiating data extraction and/or alternate means of removing data records and the technical details necessary for Project Manager evaluation.

## 6.III-1.5 System Reliability and Availability Requirements

### 1.5.1 Reliability Requirements

Reliability is defined as Mean Transactions Between Failures (MTBF) that a specific type of RFCS equipment in service is performing. Transactions are defined as completed load or payment transactions. Figure III-1.1 provides a summary of the reliability requirements for relevant RFCS equipment.

- (a) In a **low transaction volume environment**, reliability (MTBF) shall be calculated as follows:
- i. Operating time for each type of equipment shall be summed and the result divided by the number of chargeable failures. FTPs shall be considered operational unless reported non-operational.
  - ii. A **low transaction volume environment** is defined as any FTP processing zero (0) up to 250 transactions per day.
- (b) In a **high transaction environment**, reliability shall be calculated as follows:
- i. All transactions (full patron cycle) for each type of equipment shall be summed and the result divided by the number of chargeable failures.
  - ii. A **high transaction volume environment** is defined as any FTP processing 251 and higher transactions per day.

Figure III-1.1  
EQUIPMENT RELIABILITY SUMMARY

EQUIPMENT TYPE	MOHBF	MTBF	SPECIFICATION REFERENCE
	Low Transaction Volume	High Transaction Volume	
Cards	N/A	10,000*	6.III-2.3.1
FTP	7,500	120,000	6.III-3.3.2
ARKS	7,500	10,000 (8,000 with coin)	6.III-10.3.1

\* Not transaction volume dependent

### 1.5.2 Availability

Availability is defined as the probability that a device, a subsystem of a device, or a data server or computer system is operating. The base equation presented in Figure III-1.2 shall be used to calculate availability. The four primary components of availability are:

- (a) **Required operating hours** = time the equipment is required to be available to conduct transactions or other operational activities.



- (b) **Scheduled maintenance hours** (as applicable) = time required for predefined scheduled equipment and system maintenance and servicing activities.
- (c) **Required revenue servicing hours** = time required for revenue servicing activities such as exchanging money containers, and replenishing card and receipt stock.
- (d) **System out-of-service hours** = time that the relevant system is not available to conduct transactions within the predefined scheduled operating window.

**Figure III-1.2**  
**AVAILABILITY BASE EQUATION**

$$\underline{\underline{\text{Availability}_n}} = \frac{\text{effective operating hours}_n - \text{system out-of-service hours}_n}{\text{effective operating hours}_n}$$

where:

effective operating hours = (required operating hours - (scheduled maintenance hours + required revenue servicing hours)).

### 1.5.3 Failure Review Team

A Failure Review Team (FRT) shall be established to evaluate which failures are chargeable against the Contractor's reliability requirements. The FRT shall be comprised of, as a minimum, one member from the Association or designated Association representative, and as a minimum one member from the Contractor. Responsible parties within this team will initially attempt to settle any disputes. The Project Manager will make a final and binding decision on any disputes that remain unsettled after a period of two weeks after the FRT first meets to evaluate a specific failure.

### 1.5.4 Corrective Action

- (a) In the event that the devices do not meet the reliability requirements, the Contractor shall identify and implement remedial action, including, as necessary, modification of the equipment, on-site engineering services, on-site technical services, or other related action at no cost to the Association.
- (b) In the event the installed equipment does not meet these requirements, and remedial action requires the Contractor to take an individual device (other than depot maintenance devices) out of service for more than 12 hours to implement equipment

modifications or replacement, the Contractor shall arrange for a supplemental device at that location as necessary, so there is no reduction in service while remediation is taking place.

- (c) The Contractor shall provide a replacement device within 24 hours of notification.

### **6.III-1.6 Electrical Requirements**

#### **1.6.1 Equipment Power Supply**

All Equipment installed in Agency or third party facilities with the exception of any on-board equipment shall operate from a nominal line voltage of 120 VAC, within voltage tolerances of +10% to -10%, and a frequency range of 57 Hz to 63 Hz without equipment damage.

#### **1.6.2 Electrical Protection and Grounding**

- (a) The Contractor shall provide equipment that meets applicable specifications and criteria of the Underwriters Laboratories Incorporated (UL), National Electrical Code (NEC), and the regulations of the State of Washington and local jurisdictions.
- (b) All device enclosures shall contain an easily accessible master circuit breaker that will remove power from the equipment when tripped. Circuit breakers shall clearly indicate when they have been tripped.
- (c) All enclosures, chassis, assemblies, panels, switch boxes, terminal boxes, and similar enclosures or structures shall be grounded.
- (d) Protective grounding shall be provided to ensure that all exposed metal equipment and metal fixtures are connected to a common ground point in the electrical cabinet.

#### **1.6.3 Wiring**

- (a) Conductors that have the potential of operating at 50 volts or more shall not be bundled with any other lower voltage conductors.
- (b) Wire dress shall allow sufficient slack for three (3) additional "re-terminations" without excess tension.
- (c) Wire splices are not permitted.
- (d) Wire and cable ties shall not be so tight as to cause indentation and damage to the insulation.

- (e) Adhesive-mounted bases shall not be used to support wire ties or cable supports.
- (f) All conductors within each enclosure shall be installed free from metal edges, bolt heads, and other sharp or interfering points.
- (g) All conductors providing connections between components shall be provided with strain-relief, and be clear of moving objects that could damage either the conductor or the object.
- (h) All terminations and cables must be clearly indexed, labeled and schematically identifiable. All wire labels shall be non-metallic and shall resist standard lubricants and cleaning solvents.
- (i) When components must be connected to each other through individual wires, the wiring shall be incorporated into a wiring “harness,” where each branch of each circuit can be separated from others for troubleshooting.
- (j) All components interconnected through individual wires contained within a “harness” shall be disconnected from the harness by disconnecting a durable, positive-locking, indexed quick disconnect fastener.

#### **1.6.4 Printed Circuit (PC) Boards**

- (a) Where possible, all components shall be connected to the main logic circuitry by plugging into slots on a printed circuit “backbone.”
- (b) All PC boards shall be interchangeable with the same printed circuit board on other devices purchased under this contract.
- (c) All PC boards that have through holes shall be through hole plated.
- (d) All PC boards shall be at least NEMA Grade FR-4, epoxy glass, green with weave appearance, and shall have a heat/mechanical load limit of 5. The 5 indicates the “peel strength” of the laminate (pounds per inch of width needed to peel off a strip of copper cladding at an elevated temperature, NEMA publication LI 1-1971). The copper laminate shall be firmly affixed to the PC board and shall not blister or peel when heated with a soldering iron.
- (e) The component side of the board shall be silk-screen printed with component references and other identifying information which corresponds to PC board schematics to aid in repair and troubleshooting.

- (f) Sufficient clearance between components shall be provided to allow for component testing, removal, and replacement.
- (g) Identifiable test points for circuit troubleshooting shall be provided on modules and PC boards.
- (h) All markings on PC boards shall be in English.
- (i) All PC boards shall have a unique, permanent serial number that cannot be altered during normal repair.
- (j) Fuses or built-in protection shall be provided on all driver circuits to prevent damage to those transistors or other devices that drive relays, solenoids, print heads, and motors. The fuses shall be easily replaceable without damaging the PC board.
- (k) All PC boards shall be “indexed” to prevent insertion in the wrong slot or the wrong direction.
- (l) All PC boards shall contain the manufacturer catalog or reference number, version level and serial number for tracking purposes. All such identifiers shall be permanently affixed to the board.
- (m) PC boards in on-board equipment shall employ pin/socket connectors, and shall not use printed card edge fingers.

#### **1.6.5 Relays**

- (a) The contact tips of any relays shall not be placed in parallel for the purpose of carrying a current load at or above the manufacturer's contact tip rating.
- (b) Bifurcated contacts shall be used in low-voltage applications whenever necessary due to dry contact switching requirements.
- (c) All relays shall be installed such that they are fully accessible for testing, removal and replacement.
- (d) All relays shall be socketed with captive spring retainers to hold relays in place.

#### **1.6.6 Switches**

- (a) Poles of switches shall not be placed in parallel to carry current at or in excess of manufacturer's contact pole rating.

- (b) Switches shall be provided with a “keying” feature such that, after installation, the body of the switch will be constrained from mechanical rotation.

### **1.6.7 Equipment Enclosures**

Equipment will be installed in indoor and outdoor environments, with various levels of sheltering ranging from significant protection to none. All outdoor equipment shall be designed for exposure to salt laden marine air, fog, rain, hail, and other environmental conditions prevalent in the Puget Sound Area.

- (a) RFCS equipment shall be able to operate under additional environmental requirements presented in the respective subsystem technical specifications as applicable.
- (b) Enclosures shall include any provisions necessary to maintain the internal equipment at an acceptable temperature and humidity.
- (c) Enclosures shall be designed to prevent entry of moisture during a driving rainstorm and to minimize entry of dust.
- (d) Any moisture or dust entering the enclosure shall not cause short circuits or equipment failure.

## **6.III-1.7 Environmental Requirements**

### **1.7.1 Electromagnetic Compatibility**

The Contractor's approach to electromagnetic compatibility shall ensure that the electrical and electronic components and subsystems operate in their intended operational environments without being affected by or causing harmful interference. Protection shall be provided against radio frequency and electromagnetic interference (RFI/EMI) emission sources, as well as internal conductive or inductive emissions.

- (a) Operation of RFCS equipment shall not be affected by the electromagnetic fields generated by utility transmission lines, by an overhead catenary at distances as close as 25 feet, or by local power distribution lines at distances as close as 50 feet.
- (b) Operation of RFCS equipment shall not be affected by electromagnetic effects present during transit operations such as electric trolley buses and light rail vehicles.
- (c) Operation of RFCS equipment shall not affect or be affected by equipment in the Bus Tunnel, LRT right-of-way or at WSF terminals.

- (d) Operation of RFCS equipment shall not affect or be affected by other on-board equipment including vehicle power supplies, radios, automatic vehicle identification systems, and on-board data collection and processing equipment.
- (e) Contractor shall describe what provisions shall be included for EMI/RFI protection.
- (f) The Contractor shall certify through the Contractor's expense the electromagnetic compatibility of equipment to be furnished. (CDRL 9)
- (g) Equipment shall meet applicable codes, standards and specifications at the time of manufacture including, but not limited to:
  - i. Electromagnetic Emission and Susceptibility Requirements for Control of Electromagnetic Interference: MIL-STD-461C, Notice 2.
  - ii. Electromagnetic Emission and Susceptibility, Test Methods for MIL-STD-462.
  - iii. For electrostatic discharge: IEC-801-2.

### 6.III-1.8 System Documentation

#### 1.8.1 Documentation Control and Management

- (a) All software and versions used to produce documentation shall be provided to and approved by the Project Manager.
- (b) All system documentation, including manuals and training materials, shall be available for download via a project website. Additionally, unless otherwise specified, for all final documents at least seven paper copies shall be provided to the Project Manager.

##### 1.8.1.1 Documentation Website

The Contractor shall establish and manage all system documentation via a project website

- (a) All documentation shall be downloadable in a usable format through this website.
- (b) Access to the website and access to documents within the website shall be user and password controlled and available only to users as necessary, as identified by the Project Manager.
- (c) The Contractor shall update the website with the latest versions of documents throughout the Contract.

- (d) Documentation shall be in the English language.
- (e) Website structure shall be indexed using system documentation type and/or a logical grouping.

## **1.8.2 Manuals**

### **1.8.2.1 General Requirements**

The Contractor shall supply the full complement of manuals and documentation required to train Agency personnel to operate and maintain all system components installed in or on Agency facilities, or operated by the Agencies. Manuals shall be provided according to an agreed upon schedule (CDRL 27, Required Manuals Schedule). Manual shall be made available in two forms, on the project website and hard copy final versions provided to the Project Manager. All manuals shall be:

- (a) In the English language.
- (b) Divided and tabbed into logical and/or functional sections.
- (c) Indexed.
- (d) Cover both the hardware and the software associated with each system.
- (e) Updated as required over the life of the Contract to reflect all configurations operational in the field.
- (f) Furnished as “Controlled” documents and each manual shall contain a unique number.
  - i. All revisions shall be issued by manual number.
  - ii. Revisions to draft and approved manuals shall be recorded on a control list to be maintained in the front of each manual.
  - iii. The list shall be issued with each revision and shall contain the date of the revision and the page references for that revision.
- (g) The training documentation shall be separate from the operation and maintenance manuals, but may reference those manuals. (Training documentation requirements are defined in Section 6.II-12, “Training Requirements.”)

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**1.8.2.2 Paper Format**

- (a) Manuals shall be designed to withstand continuous, long-term use in a commercial environment.
- (b) Manuals shall lie flat when opened and permit easy addition and replacement of pages.
- (c) Covers for all manuals shall be made from materials that are oil, water and wear resistant.
- (d) Pages shall be 8<sup>1</sup>/<sub>2</sub> x 11 inch except where otherwise specified and double sided.
- (e) Sides of pages intentionally left blank shall be so noted.
- (f) Figures, illustrations, diagrams, and drawings shall be labeled as figures. Figures may be a maximum of 11x17 inch, folded to 8<sup>1</sup>/<sub>2</sub> x 11 inch with the identification clearly marked.

**1.8.2.3 Computerized Format**

- (a) The Contractor shall supply manuals, catalogs, diagrams, views, illustrated parts catalog, troubleshooting flow charts, and schematic drawings in electronic form on 1.44 MB floppy disks or on compact disks in the following formats:
  - i. Text shall be provided in the latest version (current production version at deployment, as agreed to by the Project Manager) of Microsoft Word, Word Perfect, or equivalent commercially available word processing program.
  - ii. Drawings shall be provided in .eps or .dxf file formats.
  - iii. Graphics files shall be provided in HTML, GIF and/or JPEG formats.
- (b) The Contractor shall be responsible for updating manuals to reflect current RFCS parameters in the event that changes are made to the system or operational procedures. Manuals shall be updated and maintained by the Contractor throughout the life of the Contract, and provided to the Association in a timely manner in the formats specified above.



#### 1.8.2.4 System Operations Manual

Seven (7) copies of the System operations Manual (CDRL 28) shall be provided. The Contractor shall include one (1) copy on an electronic file. The document shall include the following:

- (a) Complete diagrams.
- (b) Illustrations.
- (c) Instructions for operation of the system, including normal operating and communications procedures.
- (d) Diagnostic procedures.
- (e) Restart/recovery procedures.
- (f) Other necessary procedures for operating the system.
- (g) Complete descriptions of functions necessary for generating reports.

#### 1.8.2.5 System Maintenance Manual

Seven (7) copies of the System Maintenance Manual (CDRL 29) shall be provided. This document shall be comprehensive and shall provide complete detailed technical descriptions of maintenance operations, including, but not limited to, the following:

- (a) General descriptions.
- (b) Theory of operations.
- (c) Preventive maintenance schedule and activities.
- (d) Troubleshooting techniques.
- (e) Corrective measures, both temporary and permanent.
- (f) Locations and availability of support services for all major components.
- (g) Point-to-point component wiring schematics.
- (h) Assembly and disassembly drawings.
- (i) Installation guidelines.

- (j) List of required maintenance tools. Complex tools and test equipment each require a separate operators manual (CDRL 16).
- (k) Component parts lists.
- (l) Schematic diagrams.

#### 1.8.2.6 Software Documentation

Software documentation (CDRL 30) for the specific application software/firmware used for this project shall include, but not be limited to, the following:

- (a) Overview description of software/firmware for each system and subsystem, including data flow and other diagrams as necessary to demonstrate software structure.
- (b) Description of the software development lifecycle.
- (c) Identification of standards used in software development.
- (d) Commented source code listings of all application software/firmware.
- (e) Data dictionary for all elements used to include definitions, type, length.

Ownership or license rights to the software/firmware used for this project shall be as specified in the Terms and Conditions.

#### 1.8.2.7 Current Parts List (CPL)

The Contractor shall provide a comprehensive and detailed Current Parts List (CPL) for each and every component included in the system. Parts shall be numerically coded for inventory purposes.

- (a) The CPL (CDRL 31) shall be categorized and related to particular system components.
- (b) The CPL shall contain the source vendor's name, identification numbers and codes, or other means to identify the manufacturer of each component.
- (c) The CPL shall include prices and quantity discounts offered.
- (d) The CPL shall identify new component and products that will be developed for this application, as well as note which products are replacing existing equipment.

**6.III-1.9 Audit**

The Contractor shall provide the audit capabilities to track all RFCS transactions from conception to settlement.

- (a) The system shall create and maintain an audit trail of accesses to the objects it protects.
- (b) The audit mechanism shall permit the specific auditing of the actions of one or more users based on the individual's identity or security/administrative role.
- (c) Audit data shall be protected so that read access to the data is limited to those subjects authorized for review of audit data.

## 6.III-2 FARE CARD

### 6.III-2.1 Subsystem Description - Fare Card

The RFCS fare card will be the regional fare media accepted at all participating transit Agencies for fare payment.

- (a) The fare card shall be a microprocessor smart card with a contactless interface for the transportation application.
- (b) The card shall be technically capable of both reading and updating uniquely stored RFCS information through the contactless interface.
- (c) Association access to any non-RFCS applications that may be resident on the card shall be restricted without written authorization from the owner of the non-RFCS application.
- (d) A fare card with both a contact and contactless interface may be provided, and as an option include a magnetic stripe.
- (e) RFCS data shall not be accessible by any non-RFCS application without written authorization from the Association.

### 6.III-2.2 Functional Requirements - Fare Card

#### 2.2.1 Card Operating System

The Contractor shall provide a Card Operating System (COS) that conforms to the following requirements (DR 13):

- (a) The COS shall support a multi-application structure to allow for the creation and addition of new applications without interfering with the existing ones. (If multiple applications are used in conjunction with an open electronic purse, then any application added to the card shall be subject to the approval of the open electronic purse association to ensure the integrity of the open purse scheme.)
- (b) The COS shall allow the updating and/or the removal of existing applications.
- (c) The Contractor shall provide detailed information of how the COS will be designed to secure and safeguard the integrity of transaction data stored on the card such as the file protection function, data encryption algorithms, and/or Message Authentication Code (MAC).

- (d) The Contractor shall provide detailed information on how data integrity will be maintained and transactions completed for contactless operation.
- (e) The transaction speed requirements specified herein shall not be impacted by the COS security features design, specifically through the card's contactless interface. The Contractor specifications (DR 18) in that regard are subject to Program Manager review and approval.
- (f) The COS shall support blocking of Association issued cards and blocking of the RFCS application on a third party issued card.
  - i. Requests for card unblocking shall be allowed by an authorized customer service representative only.
  - ii. The COS shall support blocking only the RFCS application on a non-Association issued card in a multi-application environment.
  - iii. The blocking and unblocking function shall be controlled by the clearinghouse in accordance with RFCS policy.

### **2.2.2 Disposable Card (Option)**

The Contractor shall provide as an option, disposable contactless-only cards that shall have limited functionality for short term applications in targeted markets at a low cost.

- (a) The Association reserves the right to accept the disposable card option based on economic analysis.
- (b) The disposable card may be configurable to allow a single card to be used for group boardings; pre-loaded fixed value, i.e., phone card; or a fixed period pass.

### **2.2.3 Card Reissuance**

- (a) The Contractor may reissue returned cards.
- (b) All returned cards must be tested before they are reissued to the public.
- (c) Reissued cards shall be subject to meeting the same requirements as the new cards.
- (d) Reissued cards shall retain the original serial number and shall be tracked through the entire useful card life.

### **2.2.4 Smart Objects (Option)**

The Contractor may provide Smart Objects (e.g., key chains) that have the contactless hardware embedded into the device. Smart Objects may have full RFCS functionality, or limited functionality.

- (a) Smart Objects shall serve specific applications in target markets.
- (b) Smart Objects shall have a unique serial number and may be reloadable.
- (c) The use of Smart Objects are subject to successful completion of all specified testing requirements.

## **6.III-2.3 Performance Requirements - Fare Card**

### **2.3.1 Card Reliability**

- (a) Card failure is defined as but not limited to the failure to complete a transaction, the loss of value due to IC chip failure or electrical connection, or physical mechanical failure of card material, except for obvious physical abuse of the card.
- (b) At a minimum, the card shall achieve at least a mean 10,000 transactions before card failure.
- (c) The Contractor shall provide the Association with guidelines on verification of a card failure.
- (d) The mean defect rate for cards received in inventory shall be no greater than 0.1%.
- (e) The Contractor shall replace all defective cards at no charge immediately upon notification. If defective card problems persist, the Contractor shall also provide a written report detailing the technical explanations behind the causes of the problem, and shall correct the problem within 30 days after determination of cause.
- (f) The Contractor shall provide the Association with an option to switch to a different card supplier for further issuance at no additional charge to address reliability issues in a timely manner.

### **2.3.2 Useful Card Life**

For all Association issued cards, the fare card shall last at least four (4) years or 10,000 transactions as stated in 2.3.1 "Card Reliability" when used on a daily basis under normal circumstances for fare payment.

- (a) In the event the card graphics are a critical security feature, the graphics shall not deteriorate for at least three years when used on a daily basis under normal circumstances for fare payment.
- (b) If the RFCS application is loaded on a non-RFCS issued card, then the card life may be that of the card as established by the third party card issuer.
- (c) The pre-printed design common to all cards shall be sealed under a clear plastic laminate to protect the image.

## 6.III-2.4 Physical Requirements - Fare Card

### 2.4.1 Physical Standards

All fare cards shall conform with the following:

- (a) Basic physical standards as defined by the International Standards Organization (ISO) standards 7810 and 7813.
- (b) Specific physical standards for contactless integrated circuit proximity remote coupling cards specified in ISO 14443-1 (currently in Draft status) at the time of the Final Design Review. In instances where this emerging standard (ISO 14443) modifies or constrains other ISO standards in order to accommodate the contactless functionality, such modifications shall apply to the fare cards.

### 2.4.2 Card Memory Storage Capacity

At a minimum, the memory storage capacity shall be sufficient to support all RFCS functions and shall ensure that the card has sufficient memory to store at least two other applications similar in size to the RFCS application.

- (a) The Contractor shall choose and specify the memory capacity of the fare card given the requirements specified herein and according to the Contractor's analysis of those data and system requirements including the anticipated addition of RFCS and non-RFCS applications to the card.
- (b) The Association reserves the right to use the remaining memory on Association issued fare cards for purposes not identified at time of Contract award.

### 2.4.3 Data on the Regional Fare Card

The following minimum data segments shall be provided on the card:

- (a) Base data segment
- (b) Purse or pass type segment
- (c) Transaction history segment.

The way data is stored on a fare card is not specified.

#### 2.4.3.1 Base Segment (One Per Card)

The base segment identifies common transit payment data, is applicable to each transaction record and shall consist of the following minimum data fields:

Data Field	Comments
Card Serial Number	Regional Fare Card-assigned number
Card Expiration Date	
Value loading restriction code	Identifies parameters such as minimum payments, max. stored value permitted on card
Fare Category Type Indicator	Adult, RRFPP
RRFP Type Indicator	Senior, Disabled
RRFP Expiration Date	Required for temporary disabled
Cardholder Birth Date	Optional for RRFPP cards

#### 2.4.3.2 Agency Data (One Segment Per Agency)

Certain Agencies want to collect running totals of daily and/or monthly fare amounts paid to enable special fare arrangements or discounts to be applied according to usage rate.

- (a) This feature shall be transparent to the customer.
- (b) The Agency Data shall consists of the following minimum data fields\_ :



<b>Data Field</b>	<b>Comments</b>
Amount of Current day's fare	Optional by Agency
Amount of cumulative month's fares	Optional by Agency
Amount of cumulative 90 day fares	WSF requires both a 30 and 90 day period
Auto-Load	
Guaranteed Ride Home	
Frequent ride counter(s)	Automatic reset after Agency-defined number of rides.
Ride counter timer(s)	Automatic reset after Agency-defined period.

**2.4.3.3 RFCS Stored Value Purse (One Per Card)**

If a card has an RFCS stored value purse, monetary value will be added by the add fare process and subtracted through fare calculations. The RFCS Stored Value Purse shall consist of the following minimum data field:

<b>Data Field</b>	<b>Comments</b>
Stored Value Purse	Limit to be determined by Contractor

**2.4.3.4 Pass (For Each Pass Type)**

A card may be loaded with one or more passes. The number of passes is only limited by card memory capacity. Only one pass type may be currently active for an Agency. The Pass Purse shall consists of the following minimum data fields:

<b>Data Field</b>	<b>Comments</b>
Agency	Agency who issued pass
Start Date of Pass	First date for rides
Expiration Date of Pass	Last date for rides
Type of Pass	e.g., Monthly, Annual, Employer, Campus

**2.4.3.5 10 Day Passes (Trips or Rides) Purse**

A card may be loaded with one or more blocks of stored passes, rides or trips such as Sounder's ten individual day-passes.

- (a) The number of stored ride blocks will be limited only by card capacity.
- (b) Only one "electronic book" of stored passes, rides or trips may be active per Agency.
- (c) The 10 Day Passes Purse shall consists of the following minimum data fields:

<b>Data Field</b>	<b>Comments</b>
Agency	Agency who issued stored rides
Ride Qualification Code	Agency dependent code to handle zones or other ride qualifiers
Remaining Rides	
Expiration Date for Stored Rides	Last date for ride

**2.4.3.6 Ride History (Last Ten Rides Per Agency)**

Each time a card is tagged for a new ride, and record is created and the oldest record shall be purged.

- (a) The card shall have sufficient capacity to store ten rides for each Agency.
- (b) The Ride History shall consists of the following minimum data fields:

<b>Data Field</b>	<b>Comments</b>
Agency Providing Service	Agency providing ride
Entry Transaction Location	e.g., coordinates from GPS, AVL code, or route-run code
Ride date	
Transaction Terminal	FTP ID number
Time of Transaction	
Amount of Transaction	Amount decremented from stored value of the card for current ride or transfer
Transaction Code	Ride, Reversal, Adjustment, Transfer, Short-payment (fare)
Terminal Exit Tag	(Optional) exit FTP ID number
Time of Exit	(Optional)
Exit Transaction Location	e.g., coordinates from GPS, AVL code, or route-run code

**2.4.3.7 Revalue History (Last Five Value Adds)**

Same as the ride history, each time a card is revalued with a new value or pass, a revalue record is created and the oldest revalue record is purged.

The Agency Segment shall consists of the following minimum data fields:

<b>Data Field</b>	<b>Comments</b>
Revalue Type	Initial value, value add, pass, stored rides, reversal, adjustment
Agency ID	Agency ID of pass or stored rides
Revaluing Entity	Agency or Contractor selling value
Terminal ID of Purchase	
Purchase Date	
Time of Purchase	
Amount of Transaction	

#### 2.4.4 Graphic Requirements

All issued fare cards shall conform to a common graphic standard that shall be finalized at the final design review. The Contractor shall propose a graphics scheme which is consistent with the Association's identity program. The graphics standard shall be finalized at the final design review (FDR 14). At a minimum, the following elements shall be provided on the card:

- (a) A unique serial number shall be imprinted on the front of the card.
- (b) The serial number shall be in conformance with ISO 7812-1 standards. Its placement will be in conformance with ISO 7811-3, as constrained by ISO 14443-1 such as the last line from top/first line from bottom is unavailable for embossing because of the antenna loop in the card.
- (c) Regional Fare Coordination Project logo.
- (d) Customer Service ("800") Telephone Number shall be placed on the back of the card along with customer service related information.
- (e) Name of the Fare Card Program shall be imprinted on the front of the card.
- (f) An area for a cardholder photo shall be available for post production print, to use on Employer, Campus and/or RRFPP cards.
- (g) An area for a company logo shall be available for post production print, for use with Employer and Campus cards.
- (h) Special Graphics shall be provided if the Association chooses to issue "Collector Cards."
- (i) An area for a magnetic stripe shall be reserved for interfacing with automated teller machines (ATM).
- (j) Card Graphics shall use a minimum of four colors.
- (k) **Option** Signature Panel shall be provided on the back of the card to enable Cardholders to identify to whom the card belongs, or to differentiate one fare card from another.

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**6.III-2.5 Testing Requirements and Procedures - Fare Card**

- (a) The Contractor shall validate through the FAT tests that RFCS cards meet all the Contract requirements for wear, data retention, and interfaces to terminal devices.
- (b) The cards used in FAT shall be RFC production cards representative of those to be used in the operational RFCS.

**6.III-2.6 Security Requirements - Fare Card****2.6.1 Electronic Purse Applications**

- (a) The Contractor shall conform to the current and emerging payment system standards being developed and piloted by various bank card associations around the world.
- (b) The Contractor shall be knowledgeable of implementation policies called for in these standards and of intricate differences among them.

**2.6.2 Chip Personalization**

The Contractor shall perform chip personalization during the card issuance in the presence of a secure access module (SAM) or another smart card, which would hold the encryption key(s).

**2.6.3 Privacy**

Each card application shall be protected with a security key that will enable only the owner of the application to view the contents of the application information stored on the card. Information pertaining to a particular application shall not be accessible by the card issuer or the owners of any other application residing on the card.

**6.III-2.7 Agency or Institution Specific Requirements - Fare Card****2.7.1 Sound Transit**

The RFCS Contractor shall support Sound Transit fare collection equipment contractor with integrating the RFCS application on existing fare collection equipment. The RFCS contractor shall, under the cooperation of Sound Transit, develop the necessary RFCS software that will be loaded onto Sound Transit equipment. It is anticipated that software will be required for card to reader interface and CDCS to clearinghouse.

**2.7.2 Campus Card Model (University of Washington Husky Card)**

The following requirements shall apply to Campus Cards, specifically to the UW Husky Card. These requirements may also apply to large institutional organizations.

**2.7.2.1 Card Imprinting Requirements**

The face of each card shall include space for the following university or college-specific imprinted information:

- (a) University or college logo
- (b) “Non-Transferable Property of {university or college name}”
- (c) Cardholder name
- (d) Classification of cardholder such as Staff, Faculty, Student or Affiliate
- (e) Capability of being imprinted with up to four colors
- (f) For student cards only, “Misuse Penalty WAC 478-120 Student Conduct Code”
- (g) Cardholder photo

**2.7.2.2 Magnetic Stripe Husky Card**

- (a) Cards will be issued with an ABA standard high coercivity magnetic stripe (unencoded at issuance) on the reverse side.
- (b) The stripe shall be a maximum .218 in. from top edge of card to tip edge of magnetic stripe. Bottom edge of magnetic stripe no less than .020 in. from the bottom line of the last track encoded.
- (c) The Signal Output level of all stripes must be equivalent to 80%-130% of ISO standard output level specified for 2700-4000 Oersted stripes (as referenced in ISO Specifications 7811-6).
- (d) The magnetic stripe shall be capable of passing a test to encode UW information and then reading the information in several different types of readers on campus.
- (e) The magnetic stripe is to be used for campus applications. Use of the stripe for other applications or purposes is subject to approval by the Project Manager and the University of Washington.

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### 2.7.2.3 Barcode Requirements Husky Card

- (a) Cards shall include a cardholder-specific barcode on the face of the card for library and other applications.
- (b) Information to be included in the barcode shall be provided by UW.
- (c) The number of the barcode shall be in eye-readable format under the barcode, consisting of a combination of sixteen (16) digits and spaces, with a margin of clear space at each end of the barcode measuring no less than 3/16 of an inch.
- (d) Barcodes shall have fifteen (15) digits and conform to the CODABAR print specifications issued by Pitney Bowes' Monarch marking systems and titled "The Monarch CODABAR Code for Identification and Control".
- (e) The barcodes should be read accurately with one stroke of the Intermec light wands Models 1271 or 1281A02 attached to the Intermec Wedge Reader 9710 at least 95% of the time.
- (f) The Contractor shall test preprinted cards to assure compliance and shall provide the UW with information regarding the method of quality control used.

### 6.III-3 GENERAL REQUIREMENTS FARE TRANSACTION PROCESSOR (FTP)

The requirements stated in this Section shall apply to all configurations of fare transaction processors supplied under this Contract as described in Section 6.III-4, 6.III-8 and 6.III-9; but also, as applicable, to the related modules described in Section 6.III-5 through 6.III-7.

#### 6.III-3.1 Subsystem Description - FTP

The FTP is the region's fare collection device for the RFCS. The basic functionality of all FTPs is essentially the same, only the physical packaging is customized for the environment in which it will be used. In addition to collecting fares and validating passes, the FTP shall:

- (a) Store transaction history
- (b) Check for blocked cards
- (c) Perform automated revalue
- (d) Dump all transaction data to the Wireless Data On/Off Loading System, if directly connected, when a data transfer is initiated.
- (e) Send each transaction, as it occurs, to the Vehicle Logic Unit, if available

#### 3.1.1 FTP Configurations

The Contractor shall provide the following FTP configurations that will read the data on the fare card, process the corresponding transaction, write the correct data back to the fare card, and transfer the transaction records to the appropriate data acquisition computer (DAC) or directly to the clearinghouse system:

- (a) On-Board FTP (OBFTP) – will be used by all Agencies except WSF to process fare transactions aboard buses (Section 6.III-4.)
- (b) Portable FTP – are small, hand held devices used primarily in the WSF environment to process fare transactions where fixed equipment is impractical or unnecessary (Section 6.III-8.)
- (c) Stand-Alone FTP – are also used primarily in the Sound Transit and WSF environments in locations where a fixed, stationary device is appropriate. Rail Platforms and Ferry Docks will have multiple stand-alone FTPs which will enable passengers to tag the FTP associated with their destination (Section 6.III-9.)

### 3.1.2 FTP Configuration Requirements

All FTP configurations shall include the following elements that are described in the subsequent Subsections:

- (a) Central Processing Unit
- (b) Memory
- (c) Smart Card Interface
- (d) Customer Interface
- (e) Hardware Interface

### 6.III-3.2 Functional Requirements - FTP

The following general FTP functional requirements apply to all configurations of FTPs.

#### 3.2.0 Central Processing Unit

The FTP central processing unit shall be capable of supporting, at a minimum, the following functions:

- (a) Prior to use for fare collection or customer service, the FTP shall initialize itself and accept log-on from Agency Personnel. Method of log-on depends upon FTP configuration and is addressed in the functional requirements sections of each configuration.
- (b) Upon reading a card for fare payment, the FTP shall:
  - i. Indicate if the card is valid. A blocked or improper card shall trigger a red light on the customer display and an audible warning.
  - ii. Indicate whether or not the Cardholder has the proper fare, pass, or transfer on their card for the ride they are taking.
  - iii. Make the appropriate deduction, considering any discounts applicable, and update any appropriate trip counting data fields.
  - iv. Display the remaining value on the card and display an indication of special fare or pass type, if used, and any frequency discount which has accrued.
- (c) The FTP shall store and process the transaction data for upload to the DAC.
- (d) Using displays, light indicators, and audio tones, the FTP shall provide operator and customer feedback for each transaction.



- (e) The FTP shall maintain collected transaction data in the event of a device, interface, or power failure.
- (f) The Contractor shall provide a method to ensure the integrity of the data on the OBFTP until a successful data exchange with the WDOLS is acknowledged.

### **3.2.1 Memory**

#### **3.2.1.1 Capacity**

- (a) The FTP shall use solid state memory with sufficient capacity to store at a minimum, all data subsequent to the last data upload to the DACS including:
  - i. Up to 10,000 transaction records.
  - ii. 100 log-in / log-off records.
  - iii. 100 Event records such as, but not limited to FTP malfunctions, failed read attempts, successful and unsuccessful data up- and down-loads.
  - iv. 6,000 bad card numbers for cards issued to the general public.
  - v. Card block or status change information for all campus cards in circulation (capacity is required to update the status of all campus cards at an academic quarter or semester change).
  - vi. Secret keys for communication and card access.
  - vii. Manager passwords.
  - viii. Fare tables.
  - ix. Automatic card revalue information.
  - x. Vehicle identification number or designated location code to be programmed at time of installation.
  - xi. Any Agency specific data required.
- (b) As transaction volumes increase, FTP memory shall be expandable to a capacity of at least five times that for previously listed items i. through xi.
- (c) The Contractor shall provide data storage for the OBFTP which uses non-volatile memory.

## 3.2.1.2 Captured Ride Data

Ride data is captured in the FTP when cards are tagged by customers. The data is recorded in groups, called intervals. Using the data fields identified below and additional fields if necessary, the FTP shall capture and/or generate the following data. In addition to this, the FTP shall also capture and/or generate the data required for the WSF POS System as described in Appendix E-6.

## (a) Transaction Header Data (for each recording interval)

Each interval shares common header data, which applies to each transaction in the group. An interval may represent one direction of a route (e.g., inbound or outbound or ferry route destination), an individual vehicle stop, or it may represent a period of time at a fixed location. An example of the possible transaction header data is subsequently shown.

Data Field	Comments
Agency or Subcontractor providing ride	
Transaction Location 1	Station or Ferry Terminal
Transaction Location 2	Route or Vehicle Stop
Direction	Direction of ride (inbound or outbound) or Run Number
Ride date	
Time of Interval Start	

## (b) Transaction Detail (for each captured ride transaction)

The first part of transaction detail (current ride) reconciles rides and provides settlement data and ride statistics. The last ride data (read from card) validates transfer pricing and supports transaction reconciliation at the clearinghouse database. An example of the possible transaction detail is subsequently shown.

Data Field	Comments
Driver/Seller/Attendant Log-on	
FTP Number	
Time of Tag	
FTP Transaction ID	Transaction sequence number generated by FTP
Card Serial Number	
Transaction Code	Ride, Reversal, Adjustment, Transfer
Amount of Transaction	If fare is decremented
Remaining Value on Card	Current stored value or stored rides written back to card, depending on process code

The following set of data fields shall be provided but requires fare policy decision for activation.

Data Field	Comments
Transaction Code	
Terminal Exit Tag	
Time of Exit	
Exit Transaction Location	

It is anticipated that the following data from the Ride History (Section 2.4.3.6) on the card are required for the recovery of missing transactions.

Data Field	Comments
Last Agency Providing Service	
Location of Last Transaction	
Date of Last Transaction	
Time of Last Transaction	
Transaction Code	Ride, Reversal, Adjustment, Transfer, or Cash fare

### 3.2.2 Smart Card Interface

The FTP contactless interface shall meet ISO 14443, parts 2, 3, and 4. While this proposed standard has not yet been fully ratified as an accepted standard, fare cards shall be in conformance with its most recent release at the time of proposal submittal .

- (a) Power and Signal Interface Standards — The Contractor shall conform to the standards for contactless cards specified in the most recent release of ISO 14443-2.
- (b) Initialization and Anti-Collision Protocol
  - i. The card and FTP shall accommodate an anti-collision protocol preventing erroneous processing when more than one card is simultaneously brought within the processing range of the FTP.
  - ii. The initialization and anti-collision protocols shall conform to the specifications of ISO 14443-3 as they develop.
  - iii. In the absence of such a protocol, the Contractor shall propose a standard subject to Project Manager approval.
  - iv. **Optional:** Through operator intervention, such as holding down a designated button, an FTP shall be able to process a stack of up to five (5) fare cards. This feature is of interest to Washington State Ferries for Stage 2 implementation to support vehicle-level operations where multiple cards may

be presented simultaneously. This manual override of the anti-collision protocol shall be subject to the review and approval of the Project Manager.

- (c) Transaction Protocol
  - i. The fare card transaction protocol of those transactions that will be performed through the contactless interface, shall conform to the specifications of ISO 14443-4 as they develop.
  - ii. In the absence of such a protocol, the Contractor will propose a standard subject to Project Manager approval.
- (d) Operating Range
  - i. The card and FTP shall interface within the distances and relative orientations defined in ISO 14443.
  - ii. RFCS equipment read-write distance shall be adjustable from zero to the maximum defined in ISO 14443.
  - iii. The distance shall be optimized once the system is in operation.

### 3.2.3 Customer Interface

The Contractor shall provide a customer display to provide the customer with transaction status information as follows:

- (a) Message indicating the FTP is not operational such as, “OUT OF SERVICE”.
- (b) The Project Manager will define the message sets and formats with the Contractor during the design review process.
- (c) The message sets shall be finalized after the Beta Test program has been completed.
- (d) Display messages shall be easily edited on an as needed basis, once the system is in operation.
- (e) At a minimum, the following messages shall be provided:
  - i. Default or idle message to indicate the system is operational such as, “READY.”
  - ii. Fare type and amount deducted.
  - iii. Remaining value on the card. Activation of this feature for Full System Rollout shall be finalized after completion of the Beta Test program.

- iv. Indication of an unsuccessful transaction with reason such as, “Invalid read/encode – try again,” “Insufficient value,” “Invalid card – Call Service Center.”
  - v. Indicator that the card has a low remaining value such as “low value.”
  - vi. Message sets customized according to inter-Agency transfer agreements and fare policy.
- (f) The display menu and display messages shall be programmable using a developer’s utility, supplied by the Contractor, running on a Windows-Intel PC with the capability to upload the modified menu or messages to the FTP using a standard PC port.
  - (g) The messages and displays shall also be modifiable from a central location.

**3.2.3.1 Light Indicator**

- (a) The FTP shall be equipped with transaction status indicators visible to the customer.
- (b) These indicators shall consist of a “Green-, Yellow-, and Red-Light” to indicate a successful or unsuccessful transaction.
- (c) This feature augments the alpha numeric display. Figure III-3.1 summarizes customer visual indicators.

**3.2.3.2 Audio Indicator**

- (a) An audio feedback for indicating the completion of a successful or unsuccessful transaction shall be also be provided.
- (b) The audio indicators shall be different sounds or different volume levels of the same sound.
- (c) The FTP sound level shall be controlled with a minimum number of keystrokes or adjustments by the operator of the relevant FTP.
- (d) The type of audio feedback and the parameters are subject to Project Manager approval. Figure III-3.1 summarizes customer audio indicators.

**Figure III-3.1  
CUSTOMER INDICATOR MATRIX**

<b>Condition</b>	<b>Visual Indicator</b>	<b>Audio Indicator</b>
Successful Transaction	Green	Indicator 1

Warning - i.e. low card value	Yellow	Indicator 2
Incomplete or failed read	Yellow Flashing	Indicator 3
Unsuccessful Transaction - i.e. insufficient value, expired pass, blocked card	Red	Indicator 4

### 3.2.4 Hardware Interface

The FTPs shall be equipped, at a minimum, with the following two communications ports:

- (a) High-Speed Serial Communications Port (for connection to WDOLS in the absence of the VLU);
- (b) RS232 Communications Port (for troubleshooting and as a back-up data download/upload interface).

## 6.III-3.3 Performance Requirements

### 3.3.1 Processing Time

The processing of a transaction shall be completed within 0.3 seconds (300 ms). The following shall be concluded within this time frame:

- (a) Initialization;
- (b) Authentication and other security processes;
- (c) Data Exchange (read and encode);
- (d) Computation of fare, including applicable incentives or discounts;
- (e) Display of results on the customer (and any other applicable) displays.

### 3.3.2 Accuracy and Reliability

- (a) Accuracy for all types of FTPs is defined as the mean ratio of the number of transactions correctly recorded by the FTP, as evidenced by the transactional data recorded and stored on the fare card, to the number of transactions attempted.
- (b) As part of Factory Acceptance Testing (Section 6.II-11.4.2) and Acceptance Testing (Section 6.II-11.4.7), the Contractor shall demonstrate a minimum FTP transaction processing accuracy rate of 99.99% as identified in Item (a) above.
- (c) The FTP reliability shall be a minimum of 120,000 mean transactions between failures (MTBF) for a high transaction

volume environment and 7,500 Mean Operating Hours Between Failures (MOHBF) in a low transaction volume environment.

- (d) Any single FTP that fails more than two (2) times per month (Type II failures - see 6.II-11.4.8.7) shall be replaced with a new unit. If the new unit experiences the same failure rate, the Contractor shall be responsible to initiate an investigation to determine why the unit fails, and then shall perform repairs, or redesign the unit as necessary and replace the existing units with the redesigned units.
- (e) FTPs shall average no more than two Type II (see 6.II-11.4.8.7) failures per FTP configuration type every 90 days for the total population for each type of FTP in revenue service. This is in addition to MTBF requirements because of population size of FTPs.

### 6.III-3.4 Physical Requirements

#### 3.4.1 Appearance and Styling

- (a) Each type of FTP shall conform to generally accepted practices in appearance and styling, within the limitations of materials used for construction, and shall be approved by the Project Manager at the Preliminary Design Review. (DR 37)
- (b) All exterior surfaces shall be clean with all corners rounded.
- (c) There shall be no exposed bolt heads, nuts, sharp edges, or cracks on the outside surfaces.
- (d) All displays shall be flush mounted in the enclosures.

#### 3.4.2 Structural Features

- (a) The finish shall be orbital finished stainless steel, unless specified otherwise or approved by the Project Manager.
- (b) Provisions shall be incorporated to drain any liquids that may enter the device or condensation that may develop.

#### 3.4.3 Customer Display

- (a) The display shall be water and liquid resistant.
- (b) Any leakage into the unit shall not cause the unit to become non-operational.

- (c) The display technology shall be subject to Project Manager approval and shall meet the following requirements:
  - i. Readable under any combination of ambient lighting such as direct sunlight and night-time operation;
  - ii. At least two lines of alpha-numeric text with a minimum of twenty characters readable from 6 feet.
- (d) The display shall resist breakage due to accidental impact from hard objects, such as briefcases, during boarding, wheelchair handles or other devices used by the disabled community.
- (e) Stage 2 for WSF will require two customer displays at vehicle toll booths. Both displays shall show the same messages simultaneously.

#### **3.4.4 Locks and Security**

- (a) Access cover(s) of the FTP housing shall be opened with mechanical key(s) for maintenance access to the modules and subassemblies.
- (b) The key(s) shall be of a type that is not readily duplicated and stamped with the words "Do Not Duplicate".
- (c) Alternative means of securing the internal components shall be subject to Project Manager approval.

#### **3.4.5 Identification Labels**

- (a) A metal identification label inscribed with the FTP serial number shall be permanently attached to the outside of each FTP housing.
- (b) Major subassemblies inside the FTP shall have a permanently attached label inscribed with a unique serial number and part number prominently located on the subassembly.

#### **3.4.6 Modularity**

- (a) The FTP shall be packaged as a separate unit and not bundled with the DDU or WDOLS.
- (b) The FTP shall use connectors, approved by the Association, for all external connections.



### 6.III-3.5 Environmental Requirements

The FTPs and related modules shall be designed to comply with all applicable FCC regulations concerning conducted and radiated emissions of RF energy and shall operate in the environmental conditions provided in Figure III-3.2.

**Figure III-3.2  
FTP OPERATING ENVIRONMENT**

Parameter	Minimum Requirement
Temperature Range:	+10°F to +110°F operating; -25°F to +150°F storage
Thermal Shock:	Per SAE J1455 (Jan 88) Section 4.1.3.2
Thermal Cycle:	Per SAE J1455 (Jan 88) Section 4.1.3.1
Humidity:	20% - 90% relative humidity, non-condensing
Shock:	Up to 5g instantaneous and horizontal
Vibration:	1.5g (RMS), 5 to 200 Hz
EMI Susceptibility:  <i>Example sources: Heater and air conditioning controls, high voltage arcs, alternators, radar and radio from WSF operations, etc.</i>	Conducted MIL-STD-461B, Requirement CS06, utilizing the 400 volt, 5 microsecond pulse, both positive and negative polarity.  Radiated SAMA Standard PMC 33.1.1978 ( <i>or approved alternative</i> ), Class 2 (10 volts per meter), frequency bands a, b, & c, including paragraphs 5.3.3 (Digital Equipment Modulation Test) and 5.3.4 (Keying Test).
Other (dust, grit, rain- and salt water protection) :	Airborne particles and dust encountered in the bus operating environment, and caused by general cleaning and sweeping  Rain, clean to dusty with blown grit and sand, outdoor marine environment, airborne particles, dust and automobile exhaust combined with marine air as encountered in the WSF environment

### 6.III-3.6 Data Exchange Requirements

All software and fare table upgrades shall be loadable through a PC industry standard communications port.

The FTP clock shall be synchronized via the LonWorks port, if available on LonWorks, or with the DACS clock if not available on LonWorks. If the DACS clock is used, synchronization shall occur during data on and off loads.

### 3.6.1 Communication Ports

The Contractor shall provide a Communications Interface Specification (CDRL 32) for the FTP. At a minimum, this specification shall include a description of the data elements and communication protocols for the following required ports:

- (a) High-Speed Serial Communications Port (for connection to WDOLS in the absence of the VLU);
- (b) RS232 Communications Port (for troubleshooting and as a back-up data download/upload interface).

The Communications Interface Specification shall also describe the data elements and communications protocols for additional communication ports required by the specific FTP configurations: see Sections 6.III-4, 6.III-8, and 6.III-9.

### 3.6.2 FTP Back-Up System

- (a) The Contractor shall provide an alternate means of extracting data from the FTP, such as via a laptop computer, subject to Project Manager review and approval.
- (b) The backup system shall be used primarily to upload captured transaction data from the FTP.
- (c) It shall be possible to manually upload/download data files in the event of a device or interface failure through an RS232 port.
- (d) In the event of a primary data storage failure or backup battery failure, an indication on the display shall alert the operator.
- (e) Correct password entry shall automatically enable the FTP to download the transaction data to the back-up device.
  - i. Neither the FTP nor the backup device shall retain the correct password.
  - ii. Unsuccessful attempts to enter the password shall be logged at the FTP.
  - iii. The log shall contain detailed information including, the date, time, location, FTP number, and erroneous password.
- (f) An alternate process for initiating data extraction may be provided which shall be subject to Project Manager review and approval.
- (g) Alternate means of removing data records may be provided.

- i. The Contractor shall provide a detailed description and the technical details necessary for Project Manager evaluation.
  - ii. Alternative means of data removal are subject to Project Manager approval.
- (h) If the FTP is removed for depot maintenance, the backup method shall upload captured transaction data to a depot DAC or to the clearinghouse.

### 6.III-3.7 Testing Requirements and Procedures - FTP

In addition to testing specified in Section 6.II-11.4 "Testing Requirements" the following tests shall be performed.

#### 3.7.1 Cycling Test

Cycling test for each type of FTP shall be performed as follows on the first unit representative of the production units.

- (a) A minimum of 10,000 transactions, and at least 500 data downloads and 200 fare table up-loads shall be conducted.
- (b) Transactions shall be divided evenly among all possible fare deduction and Agency transfer transactions of which the device is capable.
- (c) The fare amounts shall be representative of those expected to be employed in the RFCS. Detailed information regarding the transaction types and values to be used in the cycling test shall be included in the Detailed Test Procedures and subject to Project Manager approval.

#### 3.7.2 Vibration Test

The Contractor shall ensure that all vehicle fleet vibration conditions expected in the area of equipment installation are taken into account to ensure that proper isolation/protection is built in to the design of equipment that may be used in an on-board environment to accommodate the range of frequencies anticipated for the vehicle fleet. The following requirements shall be met.

- (a) The FTP components shall be tested per the procedure of *MIL-STD-810C, Method 514.2, Category f, Curve V (1.5g, 5.5 to 200 Hz)* with the following changes:
  - The cycling time shall be two (2) hours on each axis for a total of six (6) hours. The equipment shall operate normally

during and after this acceleration test, and shall not experience broken or loosened parts from this vibration.

- At the conclusion of each axis frequency sweep cycle, the equipment shall be subjected to a vibration of three (3) g-forces at a frequency sweep between seven (7) and fourteen (14) Hz for a period of one (1) minute and four (4) g-forces at a frequency sweep between seventy (70) and one hundred and forty (140) Hz for a period of one (1) minute. The equipment shall operate normally after these acceleration tests and shall not experience broken or loosened parts from this vibration.

### 3.7.3 Shock Test

The FTP equipment shall be tested per *Procedure I of MIL-STD-810C* with the following changes:

- (a) The half sine shock pulse shall have a peak value (A) of 5g and a duration (D) of 20 milliseconds.
- (b) The on-board equipment shall operate normally after the shock tests and shall not have experienced broken or loosened components as a consequence of these tests.

### 6.III-3.8 Additional Security Requirements - FTP

The Contractor shall provide a means to prevent unauthorized tampering with a stolen or lost FTP and Related Modules.

- (a) The Contractor shall design the FTP to prevent unauthorized recovery of electronic value stored in the memory, or “reverse engineering” which would compromise the RFCS system security.
- (b) Back-up power source shall be provided in case of primary battery failure that provides at least 15 minutes of additional power and allow the FTP to securely power down and retain all data.
- (c) Each type of FTP shall be provided with a non-volatile memory for storage of the data files for at least 72 hours as described in the Data Backup Plan (CDRL 7).



**6.III-4 On-Board Fare Transaction Processor (OBFTP)**

**6.III-4.1 Subsystem Description - OBFTP**

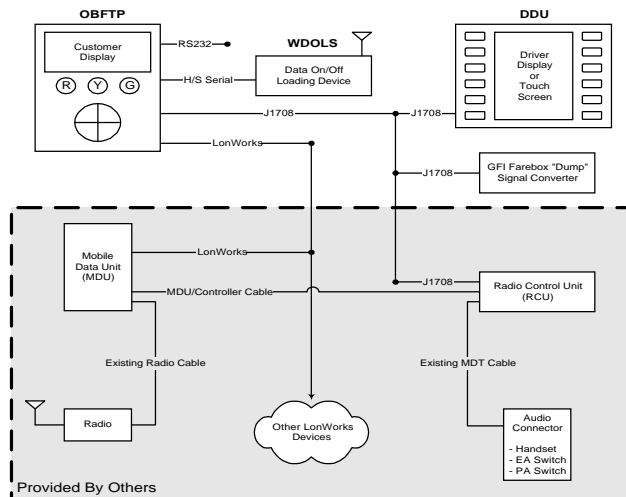
The Contractor shall provide On-Board Fare Transaction Processors (OBFTP) allowing fare cards to be read and encoded through the contactless interface during the fare payment process on-board Agency buses. The OBFTP shall consist of a CPU for processing transactions, memory for storing fare tables and transaction records, customer display, and card reader.

The OBFTP shall be capable of operating, when delivered, in a limited integration mode or as a plug-n-play peripheral (full integration mode) on an on-board network to be provided by others. Initially, the Association expects to operate the OBFTPs with a limited degree of integration, and then migrate to a full integration mode when an on-board Vehicle Logic Unit (VLU) is developed and installed by others (see Section 6.III-5). The architecture of the OBFTP shall allow each agency to migrate from the limited integration mode to the full integration mode at any time in the future. The OBFTPs, when delivered, shall be capable of supporting the following two modes of operation.

**4.1.1 Limited Integration Mode (LIM)**

In the Limited Integration Mode, the OBFTP shall store transactions until communication with the WDOLS is established and data transfer can be completed. The OBFTP shall connect to the Driver Display Unit (DDU) via SAE J1708 and to the Wireless On/Off Loading System (WDOLS) via a standard high-speed serial communications port. As an individual agency option, the limited integration mode shall provide GFI farebox keypad emulation in the DDU, and shall support communication of the farebox “dump” signal from the DDU to the farebox. See Figure III-4.1.

**Figure III-4.1  
OBFTP ARCHITECTURE for LIM**



4.1.2 Full Integration Mode (FIM)

In the Full Integration Mode, when the VLU is available, the OBFTP shall send transactions as they occur to the VLU (provided by others) for subsequent offloading to the WDOLS. The OBFTP shall connect to the WDOLS via the VLU using LonWorks ports; while the DDU shall connect to the VLU through a J1708 port. Communication between the OBFTP and the DDU/WDOLS shall be through the VLU using the networks described. The VLU will be provided by others. See Figure III-4.2.

Figure III-4.2  
OBFTP ARCHITECTURE for FIM

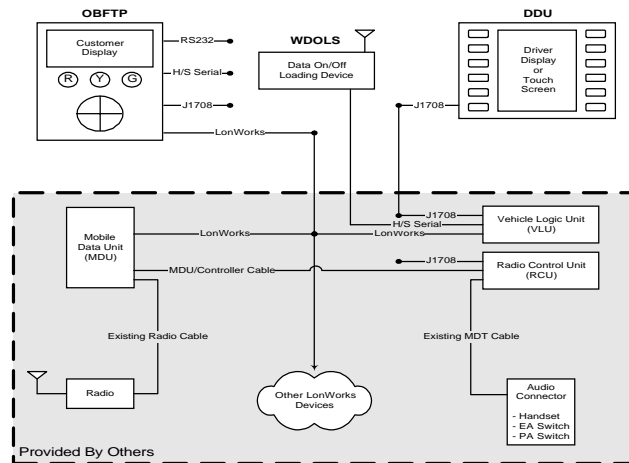


Figure III-4.3 identifies the module interfaces that apply to the Limited Integration Mode (LIM). The Contractor may suggest alternative on-board configurations in addition to the configuration provided, subject to the review and approval of the Project Manager.

Figure III-4.3  
MODULE INTERFACE SUMMARY - LIM

Modules	OBFTP	DDU	WDOLS	VLU	GFI Farebox
OBFTP		J1708	High-Speed Serial Communications	N/A	Contractor Defined
DDU			N/A	N/A	N/A
WDOLS				N/A	N/A
VLU					N/A
GFI Farebox					

*Note: The actual number of communication ports for the OBFTP is four (see Section 6.III-4.2), although some may not be used for this mode of operation.*

Figure III-4.4 identifies the module interfaces that apply to the Full Integration Mode (LIM). The Contractor may suggest alternative on-board configurations in addition to

the configuration provided, subject to the review and approval of the Project Manager.

**Figure III-4.4  
MODULE INTERFACE SUMMARY – FIM**

Modules	OBFTP	DDU	WDOLS	VLU	GFI Farebox
OBFTP		N/A	N/A	LonWorks	N/A
DDU			N/A	J1708	N/A
WDOLS				High-Speed Serial Communications	N/A
VLU					LonWorks
GFI Farebox					

*Note: The actual number of communication ports for the OBFTP is four (see Section 6.III-4.2), although some may not be used for this mode of operation.*

### 6.III-4.2 Functional Requirements - OBFTP

- (a) The following functional requirements supplement those stated in Section 6.III-3.2. The OBFTP shall accept driver input through the Driver Display Unit (DDU) for security, data collection, and operational purposes.
- (b) The OBFTP shall transfer data to and from the DAC via a wireless off/on loading system, Section 6.III-7.
- (c) The OBFTP shall have a minimum of four (4) communications ports:
  - i. High-Speed Serial Communications Port (see Section 6.III-3.2.4);
  - ii. RS232 Communications Port (see Section 6.III-3.2.4);
  - iii. SAE J1708 Communications Port (for connection to the DDU during Limited Integration Mode);
  - iv. LonWorks Communications Port (for connection to the VLU during Full Integration Mode).

### 6.III-4.3 Performance Requirements - OBFTP

The following performance requirements supplement those stated in Section 6.III-3.3.

- (a) The placement of the OBFTP shall promote an accelerated throughput of passengers.
- (b) The minimum throughput rate for OBFTP shall be 30 passengers per minute.
- (c) The throughput rates assume passengers familiar with system operation with a valid fare card, no mis-reads or cards with insufficient value, and no automatic revalue.

- (d) The Contractor shall conduct a human factors analysis with regard to the placement of the OBFTP and confirm the results of the analysis through the human factors test in accordance with Section 6.II-11.4.1.

#### 6.III-4.4 Physical Requirements - OBFTP

The following physical requirements supplement those stated in Section 6.III-3.4.

##### 4.4.1 Dimensions and Layout

A prototype of each OBFTP configuration and its mounting shall be demonstrated at time of PDR on each Agency bus type mounting location. Access to the vehicles will be coordinated through the Project Manager.

##### 4.4.2 Structural Features

- (a) All on-board equipment provided under this contract shall resist shocks equal to 5.0g without permanent deformation or failure of mounts or diminution of operational characteristics of any subsystems.
- (b) The OBFTP enclosure shall be stainless steel or approved alternative subject to the approval of the Project Manager.

#### 6.III-4.5 Electrical Requirements - OBFTP

Equipment installed on-board transit vehicles shall meet the following power supply requirements:

- (a) Nominal voltage: 12 to 24 volts DC nominal (car or bus battery)
- (b) Operating range: 9 to 39 volts DC
- (c) Equipment shall be able to withstand sustained voltage levels of up to 48 VDC for up to ten (10) minutes.
- (d) Equipment shall not suffer damage or lose data in memory when the supply is increased to 48 VDC.
- (e) Equipment shall not suffer corruption of data when the power dips below 9 VDC.
- (f) Equipment shall not be damaged by very high (twenty [20] times nominal voltage) short duration (up to ten [10] milliseconds) peak voltage.
- (g) Contractor shall indicate full operational and quiescent power drain for each on-board module proposed.



### 6.III-4.6 Data Exchange Requirements - OBFTP

The following data exchange requirements supplement those stated in Section 6.III-3.6.

- (a) To the greatest extent possible, data communications between the OBFTP and other on-board devices shall comply with the applicable Transit Communications Interface Profiles (TCIP) standards that are in effect at the time of Notice to Proceed.
- (b) Communications between the OBFTP and DDU shall be via J1708.
- (c) Communications between the FTP and future VLU shall be via LonWorks.
- (d) The Contractor shall provide the drivers and the interface software for the OBFTP and shall provide the necessary support for developing the interface software with, for example, the farebox manufacturer, AVL supplier, or smart bus contractor.
- (e) The OBFTP shall have the capabilities to allow configuration changes and system maintenance activities to occur through the use of a laptop computer. Any configuration changes and/or system maintenance activities conducted shall be accounted for in the FTP memory and a record shall be transferred to the clearinghouse during the next fare card transaction data transfer.
- (f) The OBFTP shall be also equipped with a LonWorks port that transmits a duplicate record of the transaction as it occurs which may be captured by other non-RFCS related equipment, such as the VLU, when installed under the full integration mode. The communications protocol and data record format are subject to Project Manager approval.

#### 4.6.1 Electronic Registering Fareboxes

##### 4.6.1.1 GFI Farebox Keypad Emulation

For the Limited Integration Mode, the Contractor shall emulate the functions of the GFI Electronic Registering Farebox keypad and display units, using the keypad and display of the DDU.

- (a) A record of each farebox transaction shall be entered, upon operator input, via the DDU and stored in the OBFTP in time-linear sequence with FTP transactions.
- (b) The OBFTP transaction record template shall contain sufficient fields to accommodate farebox transactions and flag the transaction as originating from the farebox.

- (c) Flagged farebox transactions shall be formatted to allow the farebox transaction data to be parsed from the database, after WDOLS upload to the DACS, for separate processing.

#### 4.6.1.2 GFI Farebox Dump Signal

The Contractor shall provide a mechanism, to be approved by the affected agency, for actuating the farebox dump key after each farebox transaction by one of the following means:

- (a) Provide a device that can accept a Farebox Transaction Complete signal from the FTP, via the LonWorks port, and convert that signal to an electrical impulse that forces the dump cycle of the farebox, via hardwired, discrete electrical connection.
- (b) Provide a Farebox Transaction Complete switch closure at a connector on the FTP that can be used to momentarily short the farebox dump key, via hardwired, discrete electrical connection.

Not all agencies may elect to choose this function for their particular configuration.

#### 4.6.2 Global Positioning System (Option)

The OBFTP shall be able to accommodate integration with a commercially available Global Positioning System (GPS) device for providing the coordinates of each transaction location.

If the Contractor proposes to provide GPS, the following requirements will apply:

- (a) The GPS device shall be LonWorks-compatible and provide its signal to other devices on the LonWorks network
- (b) The contractor shall explain how a Differential GPS correction signal will be provided to the on-board system.
- (c) The GPS device shall be a separate, modular unit approved by the Association.

### 6.III-4.7 Installation Requirements - OBFTP

The Contractor shall work with each Agency's Review Group to determine on-board equipment location and installation restrictions. Any RFCS equipment mounted in a vehicle is subject to review and approval of the relevant Agency.

- (a) All mounting hardware associated with the OBFTPs shall be provided by the Contractor.
- (b) The mounting hardware and the OBFTP shall be positioned such that it minimizes encroachment on the passenger and the driver, and does not obstruct the driver's right mirror field of vision and view to the right front of the bus including the view of the front door.
- (c) The OBFTP mounting location shall allow ease of driver entry and exit from the driver's compartment with no risk of injury such as knees.
- (d) The Contractor shall provide a flexible mounting system that allows the mounting location to be optimized, maximizing passenger throughput and driver operability and comfort.



## 6.III-5 Vehicle Logic Unit (VLU) - *[Provided by others]*

The information about the VLU in this Section is provided for information purposes only.

### 6.III-5.1 Subsystem Description – VLU

The VLU will be installed by others for the purpose of evolving to a fully integrated on-board system. This is referred to as the Full Integration Mode (FIM). When installed, the VLU will function as the on-board server or central processor. The VLU will receive a duplicate record each time a fare transaction occurs, store each record in the same format as the OBFTP, verify the accuracy of each record, and download the fare data through the WDOLS. The VLU will also support multiple, concurrent applications such as vehicle location, passenger counting, vehicle operating data, stop annunciation and other functions, and will store and buffer data from these systems for off-load by the WDOLS.

As part of the transition from Limited Integration Mode (LIM) to FIM,

- the WDOLS connection will be moved from the OBFTP to the VLU, and data exchange with the DAC will occur through the VLU; and
- the connection to the DDU will be moved to the VLU, and the operator interface with the OBFTP will occur through the VLU.

It is envisioned that the VLU and OBFTP will maintain exactly the same fare transaction data file, which will be verified upon data exchange, until cleared with instructions from the DAC. The DAC will segregate the data and forward all Smart Card transaction data to the clearinghouse.



## 6.III-6 Driver Display Unit (DDU)

### 6.III-6.1 Subsystem Description - DDU

The DDU shall display OBFTP information and provide the human interface for interacting with on-board systems. The DDU shall consist of a display, and a keyboard. The display and the keyboard shall be combined through the use of an on-board flat panel touch-screen display, or a display with soft keys on the perimeter.

In keeping with the Association's open, modular system architecture, the DDU shall be packaged separately and not bundled with the FTP or WDOLS. The DDU shall be a QSI Corporation model K60V (the "V" indicates vertically oriented aspect ratio) or Association approved equivalent.

### 6.III-6.2 Functional Requirements – DDU

#### 6.2.1 Keyboard

The keyboard shall provide the human interface with the OBFTP, the Radio Control Unit (King County requirement) and any future subsystems installed on the J1708 network, such as the VLU.

- (a) There shall be two methods of performing driver sign-on and sign-off, selectable through software at Agency option.
  - i. The driver shall be able to perform this function through a keypad.
  - ii. The driver shall be able to tag the card reader with a smart card to perform this function.
- (b) The driver shall be able to enter fare set/category, fall-back voice radio channel, operator identification, run, route or time segmentation data on the driver keypad, either as a primary data entry or as a backup to any vehicle location system which may be installed to support this function.
- (c) Data for settlement shall be collected even with driver log-on errors.
- (d) The system shall be able to collect transaction data in the event incorrect log-on data is entered by the driver, or when no log-on is entered at all, the driver shall be alerted through an audible alarm, and a flashing message on the driver display.
- (e) The keypad/board shall be used by driver to flag a transaction record in the event of a transaction that consists of a pass and a stored value fare upgrade, or to override logic in order to handle

exception conditions such as multiple boardings using a single card.

- (f) The keypad/board shall be configurable to emulate the electronic registering fare box keypad and replace the manual counters used with non-registering fare boxes. [include “dump” feature here?]
- (g) Provide a minimum of twelve soft keys.

### 6.2.2 Display

The display shall allow monitoring of the OBFTP and any subsystems connected to the VLU.

- (a) The display shall allow monitoring of the OBFTP status and mirror the customer display during each transaction.
- (b) The display shall serve as the monitor for interfacing with the FTP, RCU and the future VLU for system maintenance and configuration changes.
- (c) The Agencies will define the message sets and formats with the Contractor during the design review process (CDRL 8).

### 6.III-6.3 Performance Requirements - DDU

The DDU technology shall be subject to Project Manager approval and shall meet the following requirements:

- (a) Readable in all lighting conditions encountered on a bus during day and night, such as direct sunlight or driving in rural areas with limited outdoor lighting.
- (b) All keys or buttons shall have a minimum life of 10 million actuations.

### 6.III-6.4 Physical Requirements – DDU

The DDU shall meet the physical requirements in Section 6.III-4.4 and the following:

- (a) The DDU shall be designed to be water and liquid resistant, and the enclosure shall be water and liquid tight.
- (b) Any leakage into the unit shall not cause the unit to become non-operational.
- (c) The DDU shall resist breakage due to accidental impacts from hard objects, such as briefcases during boarding, or wheelchair handles or other devices used by the disabled community.
- (d) DDU shall be a lighted LCD graphics display with a minimum 128x240 pixels.

- (e) The keypad/board shall be designed to be water and liquid resistant, and the enclosure shall be water and liquid tight.
- (f) The maximum size of the DDU shall be 5-1/2 inches wide by 8-1/2 inches high by 4-1/2 inches deep.

#### **6.III-6.5 Electrical Requirements – DDU**

The electrical requirements specified in Section 6.III-4.5 shall apply to the DDU.

#### **6.III-6.6 Data Exchange Requirements – DDU**

The DDU shall be designed to accommodate the use of the SAE J1708 standard as the communications network for integrating to the OBFTP, the Radio Control Unit (RCU) and future VLU, when available. (DR 26)

#### **6.III-6.7 Installation Requirements - DDU**

The DDU shall be installed in accordance with the requirements specified in Section 6.III-4.7 as they apply to a DDU.

#### **6.III-6.8 Integration Requirements - DDU**

The driver display unit shall have the capabilities to replace the existing MDT as the universal display/keypad device for King County Metro and shall be adaptable by all agencies to accommodate integration with their future on-board systems.

- (a) The Contractor shall develop the necessary software to support the on-board operations of the RFCS. The Contractor's software shall be integrated with software developed by others that supports existing systems, such as King County Metro's radio/AVL system. Interface requirements for the King County RCU will be provided to the Contractor.
- (b) The DDU shall be supplied with software tools to allow modification by the Association, so that each agency can modify operator functionality to accommodate future on-board systems.



## 6.III-7 Wireless Data On/Off Loading System (WDOLS)

### 6.III-7.1 Subsystem Description

The Contractor shall provide a commercially available, off-the-shelf Wireless Data On/Off Loading System (WDOLS) as the primary method for transferring data to-and-from the OBFTP or the VLU to the designated DACS. It is intended that the WDOLS shall be used to transmit data from other sources in addition to the FTP. Also, the WDOLS may be used to transfer data from FTPs in remote locations where installing a hard wire communications link is the less cost effective solution, e.g., stand-alone FTPs located on docks in the WSF environment or platforms in the Sound Transit environment. The proposed technology shall be subject to the review and approval of the Project Manager (CDRL 39).

### 6.III-7.2 Functional Requirements

- (a) The WDOLS shall automatically initiate the data exchange when the bus enters the range of operation, and shall save the data on the designated DACS without manual intervention.
- (b) WDOLS equipment at transit bases or other fixed locations shall be able to communicate with all WDOLS equipped buses, regardless of agency.
- (c) Vehicles shall not be required to stop during the data exchange.
  - i. The Contractor shall indicate the maximum vehicle speed to permit successful data exchange.
  - ii. The vehicle speed limit shall be subject to Project Manager approval prior to implementation.
- (d) At a minimum, the WDOLS shall be used for the following:
  - i. Uploading of transaction data captured at the FTP
  - ii. Downloading of files such as:
    - Software configuration files
    - FTP initialization
    - Fare tables
    - Blocked card list
    - Automatic revalue list, if used
    - Other operational parameter tables



**6.III-7.3 Performance Requirements - WDOLS**

The data transmission speed shall be sufficient to on- and off-load on-board transaction data from the entire fleet or designated remotely located FTPs, at a minimum on a daily basis.

- (a) The WDOLS's data transfer process shall be transparent to current operations and shall not require operational modifications.
- (b) The WDOLS shall be able to operate at a range of at least 1000 feet between the vehicles and external antenna units.
- (c) The data exchange rate shall be a minimum of 1 megabit per second.
- (d) The data exchange shall not be affected by other RF sources or transmissions.
- (e) The WDOLS shall conform to the IEEE 802.11 communications standard or an Association approved equivalent.

**6.III-7.4 Physical Requirements – WDOLS**

- (a) In keeping with the Association's modular, open architecture, the WDOLS shall be packaged separately, and not bundled with the FTP or DDU.
- (b) The enclosure materials shall be high strength polycarbonate, cast aluminum, stainless steel or equivalent subject to the review and approval of the Project Manager.
- (c) Enclosure shall be vandal resistant, flame retardant and resistant to common solvents and cleaning materials.
- (d) The WDOLS shall be sealed to prevent any degradation in operation due to the accumulation of dust, salt, mud, detergents, solvents, or moisture.
- (e) Any outdoor mounted equipment shall be rated for operation in an exposed environment.

### 6.III-7.5 Electrical Requirements – WDOLS

#### 7.5.1 Vehicle Mounted Equipment

The electrical requirements specified in Section 6.III-4.5 shall apply to all vehicle mounted WDOLS equipment.

#### 7.5.2 Base or Terminal Mounted Equipment

The electrical requirements specified in Section 6.III-1.6 shall apply to all base or terminal mounted WDOLS equipment.

### 6.III-7.6 Data Exchange Requirements – WDOLS

- (a) The Contractor shall provide a high-speed serial communications device that meets the performance requirements in 6.III-7.3. In the initial, limited integration mode, the WDOLS shall be connected directly to the FTP. In the future, full integration mode, the WDOLS shall be disconnected from the FTP and connected to the VLU.
- (b) The WDOLS shall include data integrity features such as, but not limited to, a check to ensure that the data to be downloaded to the FTP has been captured by the FTP and a check to ensure that no duplicate downloads or uploads of data occur.
- (c) In the event of a failed data exchange attempt, the system shall sound an alarm at the FTP display and the DAC, and log the event in the FTP and the DAC.
- (d) Immediately following the failed data exchange event, the DAC shall notify the clearinghouse of the event.
- (e) The WDOLS shall also provide anti-collision such that multiple vehicles can be parked in the same area without loss or corruption of data.
- (f) The WDOLS shall be capable of handling data from multiple on-board sources, such as the APC system, AVL system, electronic farebox, and various engine/vehicle monitoring systems.
- (g) The Base WDOLS shall be capable of sorting multiple data types into appropriately labeled files that can be managed with standard data management software.
- (h) The contractor shall propose troubleshooting tools that allow agency staff to identify and fix data exchange problems occurring in the WDOLS.
- (i) The Contractor shall provide a method, subject to Association approval, of managing the data exchange to ensure that the appropriate data is exchanged at the appropriate location and time.

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**6.III-7.7 Installation Requirements - WDOLS****7.7.1 Vehicle Mounted Equipment**

- (a) Any WDOLS related equipment on-board any vehicle shall meet the requirements in Section 6.III-4.7.
- (b) The antenna location(s) for each agency shall be subject to approval by the respective agencies.
- (c) Any exterior mounted equipment shall be sealed to prevent leakage of rain or bus washer fluids through the life of the installation.

**7.7.2 Operating Base Mounted Equipment**

- (a) The antenna shall be mounted in or near a location approved by the Project Manager.
- (b) The Contractor shall finalize the locations of any externally mounted antennas with the Project Manager during the design review process (DR 42).
- (c) The Contractor shall mount all WDOLS related equipment and shall make all power and communications connections.

**6.III-8 PORTABLE FARE TRANSACTION PROCESSOR (PFTP)**

**6.III-8.1 Subsystem Description - Portable FTP**

The Contractor shall provide portable FTPs for Agencies that have a need for a portable card reading device, such as WSF and Kitsap. Furthermore, the PFTP may be used for paratransit, vanpools, and/or worker/driver buses.

The Portable FTP will be a handheld, ruggedized unit operated by Agency personnel to process RFCS transactions in a mobile environment. The PFTP will be powered by a rechargeable battery and at the end of a shift, will be placed in a cradle to download/upload data and recharge the battery.

The PFTP will have two operating modes. The “Limited Function Mode” (for use at WSF) will simply allow Agency personnel to collect fares and validate passes and transfers. The “Full Function Mode” (for use on Kitsap) will not only allow Agency personnel to collect fares and validate passes and transfers, but also provide card transaction history and some customer service.

The requirements stated in this section assume that a separate PFTP will be used for each destination at WSF multi-destination terminals, with the destination selectable by the agent, seller or taker. WSF’s preferred approach to be able to process transactions for multiple destinations with a single PFTP, without the need for operator or customer intervention. This is discussed further in Section 9.1.

WSF encourages solutions by the Contractor that provide multi-destination capability without manual intervention with a single PFTP.

The Portable FTP (PFTP) shall, at a minimum, consist of the modules listed in Figure III-8.1.

**Figure III-8.1  
PFTP CONFIGURATION SUMMARY**

<b>Modules</b>	<b>Portable FTP</b>
* Central Processing Unit	<b>X</b>
* Contactless Card Interface	<b>X</b>
* Customer Display/Indicator	<b>X</b>
Charger/Cradle	<b>X</b>
* Communications with DAC	<b>X</b>

“X” denotes module required by Contract

\* Module described in Section 6.III-3

### 6.III-8.2 Functional Requirements - Portable FTP

The following functional requirements supplement those stated in Section 6.III-3.2.

- (a) Log-on from Agency personnel shall occur via a log-on smart card or through the built-in portable FTP keypad. Default operating mode parameters (Limited Function or Full Function) shall be loaded at time of initialization.
- (b) The default operating mode shall be settable by the operator.
- (c) For Washington State Ferries, the operator shall be able to select a destination and associated fare basis through the portable FTP keypad.
- (d) In the Limited Function Mode, the PFTP shall require no interaction other than the tag of a card to process an entire transaction.
- (e) In the Full Function Mode, the PFTP shall do all functions of the Limited Mode, plus, Agency personnel shall be able to:
  - i. Determine card balance, number of stored rides on the card, or the existence of a pass.
  - ii. Provide historical information to the Cardholder by scrolling through the transaction history of the last five transactions stored on the card.
- (e) Data upload/download to the DAC shall be via the PFTP cradle.

### 6.III-8.3 Physical Requirements - Portable FTP

#### 8.3.1 Dimensions and Layout

A sample mockup of each PFTP configuration and its display message sets shall be demonstrated at time of PDR. (DR 27)

#### 8.3.2 Structural Features

- (a) The PFTP shall be to be light weight and constructed of materials suitable for transit and ferry operations.
- (b) The PFTP shall have a simple built-in keypad to allow operation of the device.
- (c) The enclosure shall be corrosion resistant and finished to resist abrasion and scratching.
- (d) The unit must be sealed and ruggedized to operate in an outdoor marine environment.

- (e) Color and type of finish shall be such that it minimizes reflections, cracking and peeling and shall be approved by the Project Manager during the preliminary design review.

#### **6.III-8.4 Electrical Requirements - Portable FTP**

##### **8.4.1 Rechargeable Battery**

- (a) The unit shall be equipped with a commercially available rechargeable battery, easily replaced in the field.
- (b) The battery cover shall be removable without tools and secure under normal use.
- (c) Rechargeable battery life shall be at least 8 hours under normal anticipated operating conditions.

##### **8.4.2 PFTP Cradle**

The contractor shall provide a cradle style battery charger for the PFTP.

- (a) The battery charger shall provide a regulated charge that maximizes battery life and charges PFTP batteries, at minimum, within one shift.
- (b) The PFTP cradle shall provide the communications interface to a DAC for data up and down load to the clearinghouse central system.

##### **8.4.3 Umbilical Cord**

The Contractor shall provide a 120 VAC power supply with an umbilical cord connection to the PFTP and an umbilical cord connection with a standard automotive cigarette-lighter connector for use on vehicles.

#### **6.III-8.5 Data Exchange Requirements - Portable FTP**

- (a) The PFTP shall communicate with the DACS through the PFTP cradle.
- (b) All communications shall be automatically initiated and completed when the PFTP is placed in the PFTP cradle.

#### **6.III-8.6 Additional Security Requirements - Portable FTP**

The Agent or authorized operator shall be required to enter a PIN to activate the PFTP and select the required route or service the PFTP is used on.

- (a) PFTP shall generate a record of the sign on/off.

- (b) The sign on/off log shall be transferred to the clearinghouse central system daily.

## 6.III-9 STAND-ALONE FARE TRANSACTION PROCESSOR

### 6.III-9.1 Subsystem Description - Stand-Alone FTP

Stand-Alone FTPs (SAFTP) will be ruggedized devices installed at WSF toll booths and ferry docks. SAFTPs will require only a single interaction step (tag of a card) for the customer to pay a fare or validate a pass. SAFTPs shall process card transactions without any interaction from Agency staff. They may be wall mounted or pedestal mounted.

The requirements stated in this section assume that a separate SAFTP unit will be used for each destination at multi-destination ferry terminals, with the WSF agent, seller or taker selecting the destination. Multiple SAFTPs will need to be co-located since customers bound for different destinations pass through the same fare control point. It will be the customer's responsibility to tag the correct destination SAFTP, and processing time must be comparable to current pre-ticketed operations.

WSF's preferred model is that a single SAFTP with multiple targets be used for simultaneous multiple destination operation (without operator intervention). Customers would tag the appropriate target.

WSF encourages solutions by the Contractor that provide multi-destination fare processing, recognize ergonomic constraints at WSF toll booths, and meet processing time constraints.

At a minimum, the SAFTP shall consist of the modules listed in Figure III-9.1.

**Figure III-9.1  
FTP CONFIGURATION SUMMARY**

Modules	Stand-Alone FTP
* Central Processing Unit	X
* Contactless Card Interface	X
* Customer Display/Indicator	X
Power Supply	X
* Communications with DAC	X
Pedestal	X
Remote Keyboard	X
<b>Options</b>	

"X" denotes module required by Contract

\* Module described in Section 6.III-3

### 6.III-9.2 Functional Requirements - Stand-Alone FTP

The following functional requirements supplement those stated in Section 6.III-3.2.



- (a) Log-on from Agency personnel shall occur via a log-on smart card or through the remote keypad, selectable through software at the Agency option.
- (b) The remote keypad shall allow the operator to select a destination and associated fare basis.

### **6.III-9.3 Performance Requirements - Stand-Alone FTP**

The minimum throughput rate for SAFTPs shall be 45 transactions per minute.

### **6.III-9.4 Physical Requirements - Stand-Alone FTP**

#### **9.4.1 Dimensions and Layout**

A sample mockup of each SAFTP configuration and its mounting shall be demonstrated at time of PDR for each mounting location. (DR 28)

#### **9.4.2 Structural Features**

- (a) The SAFTP pedestal shall be constructed of 14 gauge stainless steel.
- (b) The structural design shall be such that a force of 250 pounds applied in a horizontal plane at the topmost point of the SAFTP in any of the four mutual sides shall not result in the dislodging, bending, or buckling of the SAFTP and/or pedestal.

#### **9.4.3 Remote Keypad**

The remote keypad may be designed to be permanently installed, or may be modular. The remote keypad shall meet the following requirements:

- (a) All keys or buttons shall have a minimum life of 10 million actuations.
- (b) The keypad shall be designed to be water and liquid resistant, and the enclosure shall be water and liquid tight.

### **6.III-9.5 Data Exchange Requirements - Stand Alone FTP**

SAFTPs shall include a communications module for connecting to a DAC and the capabilities to be connected to a PC through a standard port. The Contractor shall provide the software for a PC that allows the use of a PC keyboard to operate the SAFTP and PC monitor to display the card data.

**6.III-9.6 Installation Requirements - Stand-Alone FTP**

- (a) SAFTPs shall be designed to be installed freestanding on a pedestal or wall mounted.
- (b) The Contractor shall provide the Project Manager with a detailed bolt pattern and mounting requirements.
- (c) The Contractor shall provide one (1) set of anchor bolts and all mounting hardware, including mounting or pedestal base if required, for each standalone SAFTP provided under this contract.
- (d) The Contractor shall be responsible for mounting the SAFTPs with bolts or other means to a concrete surface. Each unit shall be properly leveled, accommodating station platform slopes of up to 2% traverse and 2.4% longitudinal, prior to being permanently installed.
- (e) Removal of SAFTPs shall be possible without damage to concrete or attachment devices. The attachment devices shall not be exposed to the public after the equipment is installed.
- (f) SAFTP foundations, constructed by Contractor, shall include provisions for power and communications via a six-to-ten inch cubed junction box located flush with the mounting pad.
- (g) Conduit, and power and communications cables leading from the power and communications sources to the junction box shall be installed by Contractor.
- (h) The Contractor shall install the SAFTPs over the junction boxes, providing bottom entry of power and communication lines such that no wiring or cabling is exposed outside the SAFTP cabinet or base, and the Contractor shall make final connections (plug-in) to power and communications.

**6.III-10 AUTOMATED REVALUE KIOSKS (ARK)****6.III-10.1 Subsystem Description - ARK**

The Automated Revalue Kiosk (ARK) is a core revalue device, primarily for customers to load passes and stored value to their RFCS cards. ARKs purchased under this contract will be part of the Revalue Network, as described in Section 6.II-9.

Automated revalue kiosks is a configurable distribution device with the following capabilities:

- (a) Dispenses fare cards.
- (b) Encodes fare cards dispensed with fare value.
- (c) Revalues fare cards with all fare value from every participating Agency.
- (d) Accepts credit, debit and ATM cards; cash and coin; and employee “electronic voucher” as payment. (See Section 6.11-2.)
- (e) Provides customers access to view data on card.
- (f) Figure III-10.1 provides an overview of the required ARK modules.

**Figure III-10.1  
REQUIRED ARK MODULE SUMMARY**

Module	Reference
<b>Card Interface Module</b>	
Magnetic Stripe/Contact Card Reader	X
Contactless card reader/encoder	X
<b>Customer Interface Modules</b>	
Customer Display	X
Soft keys	X
Numeric keypad	X
Voice Annunciation	X
Printer/Receipt	X
Bill Acceptance Unit	X
Coin Acceptance/Return Unit	Option to be provided as kit
Fare Card Dispenser	Option to be provided as kit
Data communications	X
Cabinet	X

“X” denotes module required by Contract

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**6.III-10.2 Functional Requirements - ARK****10.2.1 Basic Operation**

- (a) ARKs shall guide the customer through the steps necessary to conduct and complete the desired transaction.
- (b) The sequence of customer actions required to complete each transaction shall be designed to be as efficient and customer friendly as possible.
- (c) The Contractor shall provide the Project Manager with scripts and screens that define all possible transaction sequences.
- (d) The sequence of actions and timing, the layout and wording of the Customer Display prompts are subject to Project Manager approval (CDRL 8).
- (e) Final approval will be provided after the Beta Test implementation is completed.
- (f) English shall be the language used.

**10.2.1.1 Transaction Selection**

The customer shall be able to choose:

- (a) Transaction type, such as add value or check card value.
- (b) Method of payment.
- (c) Desired Agency, when more than one Agency applicable.
- (d) Whether to proceed without a receipt, regardless if a receipt is unavailable.
- (e) If a customer inserts a Fare card without first selecting a transaction type, the Display shall default to an inquiry response screen.
  - i. Withdrawal of the card without any further action shall cause the unit to revert to standby for the next transaction.
  - ii. Selecting a transaction after card insertion shall interrupt the balance inquiry and proceed to next logical step in executing the selected transaction.

### 10.2.1.2 Card Balances Inquiry

The response to a “Balance Inquiry” shall display the following information:

- (a) Stored value balance on the card.
- (b) Active passes on the card, by Agency .
- (c) Stored rides available on the card, by Agency.

### 10.2.1.3 Stored Value Load

- (a) The display shall show the beginning balance.
- (b) As the customer inserts cash or conducts electronic payment transaction, the value displayed shall be increased as cash is inserted, or if a credit or ATM card is used as payment, the ending balance shall change on approval of the authorization request.
- (c) A load shall be executed after pressing a “load” or “OK” button.
- (d) When the transaction is completed and the value has been transferred to the fare card, the display shall show the ending balance.
- (e) If the patron cancels the transaction before any value has been added to the card, a refund of the total amount deposited into the device shall be returned.

### 10.2.1.4 Pass Load

- (a) For passes transactions, the customer shall select the Agency and desired fare type.
- (b) The device shall read the birth date encoded on the card, and automatically determine whether a discount is available for the requested type of fare at the relevant Agency (e.g., youth monthly pass).
- (c) The device shall display the fare type and value and the customer shall select the method of payment.

### 10.2.1.5 Cash Transactions

- (a) The display shall decrement the value shown as funds are added.

- (b) As soon as the amount paid is equal to or exceeds the fare value, the purchase shall be encoded onto the card and, if the option is implemented, change shall be returned automatically.

#### 10.2.1.6 Credit, Debit and ATM Card Transactions

- (a) Customers shall be prompted for a PIN, if applicable; the transaction shall be authorized and, if successful, the fare card shall be encoded.
- (b) A receipt in accordance with the requirements of Regulation E or the gateway bank shall be printed.

### 10.2.2 Operating Modes

ARKs shall operate in three modes:

#### 10.2.2.1 Normal Service Mode

The default mode of a fully functioning ARK providing all services and accepting all of the forms of payment.

#### 10.2.2.2 Limited Service Mode

- (a) When one or more of the ARK capabilities become non-functional, the unit shall continue to provide the revenue services with the remaining functional capabilities.
- (b) When in this mode, the unit shall clearly indicate to the customer the nature of the limitation(s), prior to the initiation of the transaction whenever practical, but in every instance immediately after selection of an inoperable function.
- (c) At minimum, the following limited service modes shall be accommodated:
  - i. Credit, debit or ATM Card only – both coin and bill acceptance are inoperable.
  - ii. Cash only – card acceptance is inoperable.
  - iii. Bills only – coin acceptance is inoperable.
  - iv. Exact change only – No change returned.
  - v. Receipt unavailable – when the printer is inoperable.
  - vi. No card dispensing – only revalue and view data.

### 10.2.2.3 Maintenance Mode

- (a) Each type of device shall be capable of operating in a maintenance mode to assist maintenance personnel in the performance of preventative maintenance, trouble shooting and repairs.
- (b) The maintenance mode shall be triggered by the insertion of a special maintenance smart card into the card unit, the correct entry of its associated PIN into the numeric keypad of the unit, and completion of the associated maintenance personnel verification processes.
- (c) All transactions performed under this mode shall be differentiated by a separate code in the transaction record.
- (d) The maintenance mode shall be automatically canceled once the ARK is closed and reactivated to normal service.
- (e) The Contractor shall develop and document for Project Manager review and approval, the security processes to be used to enter this mode and the types of procedures and transaction processes which may be performed within it. (DR 33)

## 10.2.3 Central Processing Unit

### 10.2.3.1 Controller

- (a) At minimum the ARK CPU shall consist of standard components, including, at a minimum, Windows NT 4.0 or approved equal on an Intel-Pentium II based platform or approved equal.
- (b) The applications shall be programmed in high order languages such as JAVA, Visual Basic, or C++ and distributed objects.
- (c) ARK memory shall be initially sized 200% of required estimated capacity based on projected transaction volumes. The assumptions associated with the transaction volume projections are subject to the review and approval of the Project Manager (DR 31).
- (d) Provisions shall be included to allow ARK memory to be increased by 500% from the initial configuration.

### 10.2.3.2 Data Capture

At a minimum, the following data shall be communicated:

- (a) **Event data** - generated by the ARK to indicate operational status of the device, the status of its dispensing and accepting hoppers and vaults, including warnings and alarms.
- (b) **Transaction support messages** - such as card payment authorization message flows. If the device is configured for full time, leased line communications, all transaction data shall be captured in real time.
- (c) **Revenue service and audit data** – such as the removal and insertion of revenue service components.
- (d) **Detailed transaction data** – related to the distribution services provided at that device since the last poll period, unless this information is captured in real time.

### 10.2.4 Customer Interface Modules

The customer interface modules shall consist of three primary sub-systems - the Customer Display, Soft Keys, and a Numeric Keypad. Voice annunciation and other design features shall be provided as required to meet ADA requirements.

#### 10.2.4.1 Customer Display

- (a) Display shall operate in conjunction with the soft keys, numeric keypad and voice annunciation to provide message and menus necessary to guide the customer through the selection and performance of every transaction.
- (b) It shall also provide directions to maintenance and revenue service personnel as appropriate.
- (c) Customer directions shall be given in a minimum of three languages, English and two others to be selected in the future.
- (d) The Display shall be clearly visible under all lighting conditions, including direct sunlight, and from an angle of up to 15 degrees in any direction from its center.
- (e) The Display shall be a service proven unit and may be monochrome or color. The display is subject to review and approval by the Project Manager.



- (f) The Display shall be located such that it can be easily read by customers ranging in height from 3'-6" to 6'-9".
- (g) The Display shall be made vandal resistant through use of a shatter proof polycarbonate or glass (even after etching) front cover panel attached from the inside of the door and be easily field replaceable.
- (h) The display shall be, at a minimum, 16 rows of 40 characters, approximately 0.375 inches high and 0.25 inches wide per character.
- (i) Sequence of actions and timing, the layout and wording of the Customer Display prompts shall be subject to the review and approval of the Project Manager (CDRL 8).

#### 10.2.4.2 Soft Keys

- (a) On each side the display units, there shall be a minimum of four, and a maximum of five soft keys.
- (b) The number of soft keys shall be consistent with the instruction sequences designed by the Contractor and approved by the Project Manager.
- (c) Each soft key shall have tactile and audible feedback during use, and shall have Braille labels.
- (d) The parallax errors in the visual links between the soft keys and the associated command line on the Display shall be minimized.
- (e) Soft key functionality may be provided through the use of a touch screen.

#### 10.2.4.3 Numeric Keypad

A single numeric keypad shall be used for customers to enter transaction data and PIN numbers for debit card transactions.

- (a) The keypad shall be located in a semi-recessed area of the front panel to provide the maximum privacy practicable during use.
- (b) The keypad shall prevent moisture from getting inside the unit, shall be vandal resistant and shall be easily replaceable from the inside.
- (c) The keypad shall include a minimum of 16 keys laid out in the standard ATM format with keys for digits from 0 to 9, a "\*" key, a

“#”, a red “Cancel” key, a “Yes” and “No” key and a green “OK” key.

- i. The letters, numbers, symbols and words on the keys shall be wear proof.
  - ii. The numbers and letter on the keys shall not be applied through painted surface application, process, baked or otherwise.
  - iii. The number “5” key shall have a raised dot to permit recognition by the visually impaired.
- (d) The keypad shall support DES and Unique Key Per Transaction (UKPT) encryption methodologies to support secure PIN entry.
- (e) Transport keys shall be destroyed upon tampering with unit.

#### 10.2.4.4 Voice Annunciation

- (a) Voice annunciation shall be provided to assist the visually disadvantaged with the operation of the unit, if required to meet ADA.
- (b) The system shall operate in English.
- (c) The voice system shall duplicate all messages and prompts shown in the customer display during the transaction process.
- (d) Voice annunciation shall be activated through a dedicated button on the front of the device identified by raised letters.
- (e) The voice annunciation system is subject to Project Manager review and approval. (DR 38)

#### 10.2.5 Card Interface Module

- (a) The Contractor shall provide an integrated design for processing magnetic stripe cards and fare cards if a contact interface is used for reloading fare cards.
- (b) It shall be possible to restrict use of credit, debit and ATM cards for payment of selected transaction types, and to restrict card payments to minimum transaction values.
- (c) These parameters shall be adjustable according to individual Agency policies.

### 10.2.5.1 Credit/Debit/ATM Card Readers

Devices accepting bank-issued ATM and credit cards for payment, or cards issued by parties such as American Express, Diners Club, Discover and JCB, shall have the ability to read the data on Tracks 1 and 2 on the magnetic stripe.

- (a) The card reader shall comply with the EMV Specification.
- (b) The ARK shall be upgradeable in the future to accept open e-purse schemes as payment.

### 10.2.5.2 Fare Card Reader/Encoder

- (a) Fare cards shall be loaded using the card interface.
- (b) The read-write technology shall be subject to Project Manager approval. (DR 36)
- (c) The read/encode device shall “lock” the fare card in place, during the time it is completing transaction (contact interface).
- (d) The lock shall release if the Revalue Device fails at any point during the transaction or if the transaction is canceled (contact interface).
- (e) The Contractor shall provide features for maintaining data integrity and completing the transaction for a contactless interface.

### 10.2.6 Printing

- (a) Only one printer shall be used in the ARK to perform all of the printing required. The printing functions include, but are not limited to printing of any receipts required for customers, transfers, and local printing of maintenance and service reports or codes during the maintenance or revenue servicing.
- (b) The data to be printed, and the formats in which it will be printed, shall be software configurable.
- (c) The printer shall utilize either dot matrix or thermal printing technology.
- (d) Ribbon cartridges, if any, shall be field replaceable and shall have a shelf life of at least two years before initiation of degradation.
- (e) The print quality of the printer is subject to Project Manager approval (DR 54).

**10.2.7 Bill Acceptance Unit**

- (a) The bill acceptance unit shall accept \$1, \$5, \$10 and \$20 bills, US currency in all formats in circulation, inserted in any orientation (four directions).
- (b) The bill acceptance system shall have an escrow unit.
- (c) Acceptance of each denomination of bill shall be enabled or disabled by software commands transmitted from the DACS or clearinghouse that is controlling or monitoring the ARK.
- (d) The bill acceptance unit shall be self-calibrating to accommodate variability between bills, and new bills introduced into circulation. The Contractor shall define the acceptance parameters as part of the design review (DR 29).

**10.2.7.1 Bill Vault**

- (a) After customer accepts the transaction, bills shall be stacked in the bill vault.
- (b) A security interlock shall prevent the bill acceptor from accepting bills until a bona fide vault has been inserted and locked in place correctly.
- (c) Each bill vault shall have the capacity of storing a minimum of 1,500 bills taken from general street circulation.
- (d) A separately keyed lock shall control access to the vault for the removal of bills.
- (e) Each vault shall be individually identifiable by a unique, permanently inscribed serial number and a certifiable electronic ID.
- (f) The total amount of money and number of bills deposited into the vault shall be monitored by the ARK control system from the time an empty vault is inserted.
- (g) The vault monitoring process shall transmit a signal to the clearinghouse to indicate a "Near Full" condition when the vault is approximately 85% full, and a "Full" condition when it has reached capacity.
- (h) On reaching the "Full" condition, the ARK will revert to a "Card Only" mode of operation.

**10.2.8 Coin Acceptance/Return Unit - Option**

- (a) The coin acceptance/return unit shall accept the following US coins: nickels, dimes, and quarters.
- (b) The coin acceptance/return system shall be programmable and re-configurable to accept coins other than those listed, particularly the proposed new US dollar coin.
- (c) The coin banks shall be as universal as possible such that a single type of bank can accommodate as many different denominations of coins as possible.
- (d) All coins shall be deposited through a single common coin slot which shall contain a shutter to prevent entry of dirt, moisture, or foreign objects.
- (e) Coins shall be verified and counted. Unacceptable coins shall be rejected individually and sent to the return tray.
- (f) A coin release control shall be provided to enable jammed coins and foreign objects to be released, and return of coins inserted prior to transferring value on to card.
- (g) The coin handling mechanism shall allow maintenance personnel to easily gain access and clear a jam.

**10.2.8.1 Coin Vault**

- (a) A key-operated mechanism – one for opening and one for removing the coin vault - shall secure the coin vault in the ARK.
- (b) A security interlock on the coin handling mechanism shall ensure that coins are deposited into the coin vault only when a bona fide coin vault is inserted and is in its proper operating position.
- (c) The interior contents of the coin vault shall not be exposed or accessible during any portion of the revenue collection process.
- (d) Each coin vault shall be individually identifiable by a unique, permanently inscribed serial number and an electronic ID.
- (e) The control system of the ARK shall continuously monitor the total amount of money in the coin vault.
- (f) The monitoring process shall transmit a signal to the computer system through which the ARK is being monitored to indicate a

“Near Full” condition when the vault is approximately 85% full, and a “Full” condition when it senses it has reached capacity.

- (g) On reaching the latter condition, the ARK will revert to “Bills and Cards only” mode of operation.

#### 10.2.8.2 Change Return

- (a) Coins shall be recirculated after acceptance to be used as change during subsequent transactions.
- (b) Change shall be dispensed in appropriate denominations, such that the fewest number of coins are dispensed.
- (c) Each denomination shall be sorted into separate coin storage units with a minimum capacity of 50 coins each.
- (d) Two non-replenishing supplemental change storage units shall be provided to accommodate any of the coin denominations listed above, which shall have a minimum capacity of 700 coins each.
- (e) If the device is unable to issue change, for any reason, but is otherwise operable, it shall display to the customer “Exact Change Only.”

#### 10.2.9 Fare Card Dispensing - Option

- (a) The ARK shall include a fare card dispensing unit to distribute fare cards with no encoded fare value.
- (b) The minimum card stock capacity shall be 300 fare cards fully loaded.
- (c) The card dispensing unit shall include an adjustable sensor that notifies the clearinghouse central system when card stock is low.
- (d) It shall be possible to expand the fare card dispensing capabilities to allow distribution of up to two different card stocks.

### 6.III-10.3 Performance Requirements - ARK

#### 10.3.1 Overall Reliability

- (a) The following reliability rates, Mean Transactions Between Failure (MTBF), shall apply for a high transaction volume environment: 10,000 MTBF nominal or 8,000 MTBF with coin handling.
- (b) The reliability shall be 7,500 Mean Operating Hours Between Failure (MOHBF) in a low transaction volume environment.

- (c) High and Low Volume Transaction environments are defined in Section 6.III-1.5.1 (a) and (b).
- (d) Any component or assembly within an ARK that fails more than two (2) times per month shall be replaced with a new component or assembly.
  - i. If the new component or assembly experiences the same failure rate, the Contractor shall be responsible to initiate an investigation to determine the cause.
  - ii. Alternatively, failures shall average no more than two (2) failures per device type every 90 days for the total population for each type of ARK in revenue service.

### 10.3.2 Availability

Availability shall be measured at a minimum for the following:

- (a) ARK shall be available to conduct a transaction 99.73% [ $\sigma$   $\sigma$  (second sigma)] during operating hours.
- (b) Credit or debit card authorization shall be available as specified in Section 6.III-1.5.2, "Availability."
- (c) ARKs shall be available to transmit data upon request to the clearinghouse 99.73% [ $\sigma$   $\sigma$  (second sigma)] during the scheduled time periods for these activities (refer to Section 6.III-1.5.2 "Availability").
- (d) Contractor shall provide a detailed plan that describes the methodology of capturing and processing the data to be used to measure availability (CDRL 11).

### 10.3.3 Individual Components

- (a) The card reader shall have a reliability of at least 50,000 mean transactions between failures on a reader processing at least 10,000 transactions per month.
- (b) A thermal printer MTBF shall exceed two million characters and the life of the print head shall exceed 50 million characters.
- (c) For dot matrix printers, there shall be no noticeable degradation in print quality for at least 250,000 lines of twenty (20) characters per line or six (6) months, whichever comes first.

- (d) Not less than 98% of all valid coins shall be accepted upon initial insertion. Not less than 99% of the rejected coins shall be accepted upon second insertion.
- (e) The maximum time to process a bill shall be 2.0 seconds measured from the time that the bill is first presented to the time the bill acceptor is ready to accept the next bill.
- (f) The bill acceptor shall reject all counterfeits of bills, bills on a string, bills on a tape, photocopies of bills, including those made with magnetic ink and foreign bills.
- (g) The bill acceptor shall accept at least 95% of all valid bills in “street condition” on the first insertion attempt and at least 98% of the rejected bills on the second attempt. Street condition bills are those found in everyday use by customers that are not torn, crumpled, folded or worn to an extreme.

#### **10.3.4 Accuracy**

- (a) The electronic payments functions shall have an accuracy rate of 99.73% ( $\sigma$   $\sigma$  sigma).

Accuracy for all types of electronic payments is defined as the mean ratio of the transactions value recorded by the device as evidenced by the transactional data recorded to the actual transaction records received and processed by the clearinghouse.

- (b) The cash transaction functions shall have an accuracy rate of 99.5%.

Accuracy for the cash processing functionality is defined as the mean ratio of the moneys recorded as evidenced by the audit receipts produced by the device to the actual moneys in the bill and coin vaults as counted. Cash reconciliation differences attributable to beginning inventory shortages or loading errors shall be excluded. Differences attributable to counting errors shall also be excluded. Reconciliation differences shall be reported by relevant device within 24 hours.

### **6.III-10.4 Physical Requirements - ARK**

#### **10.4.1 Dimensions and Layout**

- (a) The Contractor shall provide the dimensions of an existing service proven ARK that does not require significant modification to meet the functional requirements of this specification.



- (b) A mockup of the ARK customer interface shall be provided at time of PDR. (DR 29)

#### **10.4.2 Structural Requirements**

- (a) The ARK cabinet doors, sides, and top shall be constructed of 14 gauge stainless steel.
- (b) Any metal cabinet surfaces not constructed of stainless steel shall be primed and painted.
- (c) ARK structural framing shall be of carbon steel or stainless steel.
- (d) The base of the ARK shall be an integral element of the interior structural frame so that when the base frame is anchored, the entire ARK interior structure is anchored.
- (e) The structural design shall be such that a force of 250 pounds applied in a horizontal plane at the topmost point of the ARK in any of the four mutual sides shall not result in the dislodging, bending, or buckling of the ARK.
- (f) The top of the ARK shall withstand loads of 300 pounds without causing any permanent deformation.
- (g) Hardware, including the case, heat sinks, mounting brackets, etc. shall be protected against moisture, oxidation, and common airborne contaminants.
- (h) Drainage in the base of the cabinet or other moisture removal provisions shall be made to keep the interior cabinet dry in the event water enters the interior.
- (i) Hinges and latches shall be constructed of a metal not subject to corrosion.
- (j) Any exposed fasteners shall be stainless steel and shall be of a tamper proof design previously approved by the Project Manager.
- (k) No protruding screws, fasteners, or sharp metal edges shall be permitted on the exterior or interior of the enclosures.
- (l) Self-tapping screws are not allowed to mount any piece of equipment which might require removal for repair or maintenance.
- (m) The Contractor shall minimize the number of different styles and sizes of fasteners used within the ARKs.

- (n) Any non-stainless steel fasteners shall be zinc or cadmium plated.

### 10.4.3 Security

The design and manufacture of the ARK, including all removable sealed money containers (coin vaults, bill vaults, coin storage units, and non-replenishing supplemental change storage units) shall ensure the highest degree of security.

- (a) Cabinet design shall provide protection against vandalism and burglary, or ARK removal.
- (b) All security arrangements shall be submitted for Project Manager approval.

#### 10.4.3.1 Front Door Access

- (a) The front door shall contain a lock requiring a key to open.
- (b) Door open shall be defined for all times when the door panel is 1/4 inch from its closed and locked position, along the side opposite the hinges.
- (c) Once the front door has been opened, a siren intrusion alarm shall be initiated, after a timed interval, unless personnel follow a correct entry procedure. The siren intrusion alarm shall have a separate, back-up battery source.
- (d) Means to open the front door during a power outage, shall be provided.

#### 10.4.3.2 ARK Access Method

- (a) The ARK shall conform to the following access methods:
  - i. Key to access front door.
  - ii. Personalized smart card (with security code) insertion when the front door has been opened.
  - iii. Individual PIN entered, minimum four digits.
  - iv. Shunt key for siren type intrusion alarm.
- (b) The smart card and ID numbers shall be software programmable and down-loadable from the clearinghouse central system.
- (c) Insertion of an invalid smart card or failure to enter the correct PIN code after two (2) attempts and within the prescribed time period after the door is opened shall activate a siren type intrusion alarm.

- (d) The siren alarm shall sound for a time period adjustable from zero (0) seconds up to the entire time the front door is open.
- (e) The adjustable duration shall be set initially to the entire time the front door is opened without valid access codes.
- (f) A means to deactivate the siren shall be provided and subject to Project Manager approval.
- (g) The duration and type of sound shall be configurable parameters.

#### **10.4.4 Locks And Keys**

All locks and keys used on the ARK shall be of the high-security type e.g., Medeco or Project Manager approved equal.

- (a) Security keys shall be registered, and new or additional keys shall be available only from the manufacturer.
- (b) The exterior lock type and design shall be subject to Project Manager approval (DR 29).
- (c) The following keys shall be used interchangeably among all ARKs:
  - i. Key to access the front door.
  - ii. Key to access money containers.
  - iii. Revenue keys for removing bill vault, coin vault, non-replenishing supplemental change storage unit and recirculating coin storage unit from the ARK.
  - iv. Key to shunt the siren alarm (if necessary).

#### **10.4.5 Identification Labels**

- (a) A metal identification label inscribed with the ARK serial number shall be permanently attached to the outside of each ARK housing.
- (b) Major subassemblies inside the ARK shall have a permanently attached label inscribed with a unique serial number and part number prominently located on the subassembly.

**10.4.6 Modularity**

Assemblies including, but not limited to, the bill acceptor, coin acceptance mechanism, microprocessor, video display, magnetic stripe reader, and printing unit shall be modular, easily removable, and commercially available in the event of failure.

**10.4.7 Illumination**

The ARK shall be provided with a lighting fixture to illuminate the face.

- (a) The lighting fixture shall be constructed in a manner to keep out dirt, moisture and insects.
- (b) The lighting fixture shall remain on at all times, and a manual shut-off switch shall be provided on the interior.
- (c) The lighting source shall utilize a commercially available top source, opaque, light diffusing glass to provide glare free illumination.

**6.III-10.5 Electrical Requirements - ARK**

- (a) In the event of a power interruption, a rechargeable dry or sealed gel cell battery source (or UPS) shall provide auxiliary power to the ARK to complete the transaction in progress, and allow for orderly shutdown of the ARK, including transmitting all audit data and alarm conditions to the clearinghouse central system.
- (b) UL Listing of the equipment is not required, but the Contractor shall certify that the ARKs furnished under this Contract have been designed to meet UL Vending Machine Criteria No. 751. (DR 35)

**6.III-10.6 Environmental Requirements - ARK**

ARKs shall be designed to operate outdoors without protection in the environmental conditions provided in Figure III-10.2.

**Figure III-10.2  
OPERATING ENVIRONMENT**

<b>Automated Revalue Kiosks</b>	
Temperature Range :	+14°F to +99°F, Ambient
Humidity :	5% - 100% RH
Shock :	Up to 5g horizontal
Vibration :	Same as section
EMI:	Same as section
Other (dust, grit, rain and saltwater protection) :	<ul style="list-style-type: none"> <li>• Maximum 3 inches of rain in 24 hours</li> <li>• Maximum 14 inches snowfall in 24 hours</li> <li>• Wind (70 MPH gusts)</li> <li>• Clean to dusty with blown grit and sand and marine environment including direct and indirect exposure to salt and saltwater.</li> </ul>

### **6.III-10.7 Data Exchange Requirements - ARK**

- (a) ARK shall be able to communicate to the clearinghouse system through dial-up or leased line configurations. Configuration selection shall depend on transaction volumes.
- (b) The Contractor shall provide information on proposed data transfer method and protocols (DR59).
- (c) Under normal operations, all data transmission shall be initiated automatically.

### **6.III-10.8 Installation Requirements - ARK**

- (a) ARKs shall be designed for freestanding installation.
- (b) The Contractor shall provide the Project Manager with a detailed bolt pattern and mounting requirements (CDRL 33).
- (c) The Contractor shall provide one (1) set of anchor bolts and all mounting hardware, including mounting or pedestal base if required, for each ARK provided under this contract.
- (d) The Contractor shall be responsible for mounting the ARKs with bolts or other means to a concrete surface. Each unit shall be properly leveled, accommodating mounting platform slopes of up to 2% traverse and 2.4% longitudinal, prior to being permanently installed. Platforms may include stations (indoor and outdoor), curbside, and WSF terminals.

- (e) Removal of ARKs shall be possible without damage to concrete or attachment devices. The attachment devices shall not be exposed to the public after the equipment is installed.
- (f) ARK foundations, constructed by Contractor, shall include provisions for power and communications via a six-to-ten inch cubed junction box located flush with the mounting pad.
- (g) Conduit and power and communications cables leading from the power and communications sources to the junction box shall be installed by Contractor.
- (h) The Contractor shall install the ARKs over the junction boxes, providing bottom entry of power and communication lines such that no wiring or cabling is exposed outside the ARK cabinet or base, and the Contractor shall make final connections (plug-in) to power and communications.

### **6.III-10.9 Testing Requirements and Procedures - ARK**

#### **10.9.1 Bill Handling Unit Testing**

All bills used for Factory Acceptance Testing shall conform to the following criteria:

- (a) No corner folds which exceed 0.05 square inches.
- (b) No holes.
- (c) No missing pieces beyond a single corner not exceeding 0.05 square inches.
- (d) No tears beyond a single tear in any location not exceeding 1/4-inch.
- (e) Not limp, discolored or faded due to previous soaking in water, soiling with other liquids or worn to partially destroy the printing.
- (f) Not wet to the extent that water may be twisted or wrung from their surfaces.
- (g) Flattened if crumpled, creased or folded.

All bills used for the FAT which do not meet the above requirements shall be culled or corrected to meet the specified conditions prior to commencing the test. Any jam caused by bills accepted as part of the test lot shall result in failure of the test. The mix and condition of coins shall be representative of media in circulation.

**10.9.2 Cycling Test**

A cycling test for the ARK shall be performed as follows:

- (a) A minimum of 10,000 transactions shall be conducted.
- (b) Transactions shall be divided evenly among all possible card purchase and load transactions of which the device is capable.
- (c) The transactions shall also employ all possible payment combinations for a device.
- (d) The stored value amounts, stored pass and stored ride types and amounts, and fare amounts shall be representative of those expected to be employed in the RFCS.
- (e) Detailed information regarding the transaction types, values, and payment methods to be used in the cycling test shall be included in the Detailed Test Procedures and subject to Project Manager approval.

## 6.III-11 CUSTOMER SERVICE TERMINAL (CST)

### 6.III-11.1 Subsystem Description - CST

The CST shall provide the capabilities necessary for supporting RFCS through the Agency's customer service offices and for phone inquiries. The Customer Service Terminal (CST) shall at a minimum provide the following customer service capabilities:

- (a) Initialize and issue all types of fare cards.
- (b) Encode personal data onto fare card and record it in the RFCS database.
- (c) Create PIN numbers for fare cards (card linking).
- (d) Process, at a minimum, payment by cash; credit, debit and ATM cards, electronic vouchers, checks, requisitions and purchase orders. Revalue fare cards with fare value from any Agency.
- (e) Issue refunds and replace fare cards.
- (f) Show remaining value and pass status of card.
- (g) List the last ten fare card transactions.
- (h) Unlock locked-out fare cards.
- (i) Provide a transaction history on each fare card by accessing the clearinghouse database, and ability and to print duplicate receipts.
- (j) Print receipt for each transaction or inquiry of remaining value.
- (k) Enroll customers in automatic revalue program.
- (l) Support the sales of non-RFCS products.

### 6.III-11.2 Functional Requirements - CST

- (a) The CST shall provide a means of quickly selecting "express transaction" types for the most common types of card values loaded. For fares dependent upon origin/destination, the default origin shall be the zone in which the CST is installed. However, CSTs shall be capable of selling rides for any origin/destination pair.
- (b) The CST shall be able to read and encode on the fare card any value up to the maximum limit, load any pass or type of ride for any Agency.



- (c) The Agency personnel shall be able to initiate the type of transaction by selecting the type of value to be loaded for a selected Agency, and origin-destination or zones if applicable.
- (d) Agency personnel shall be able to cancel a transaction at any point during the purchasing process prior to the initiation of the transfer of value to fare card.
- (e) The CST shall prompt Agency personnel to select the payment type.
- (f) A transaction receipt may be printed at the CST upon request for any type of payment. CSTs for WSF shall print receipts for every transaction by default.
- (g) Upon the completion of the transaction selection, the CST shall calculate and display the amount due for the selected card value loaded on the operator display as well as the external customer card interface unit display.
- (h) The CST shall be able to reverse the value that has been loaded on to fare card and provide an audit trail of who reversed it, including time date and terminal ID.
- (i) At the end of a sales day, the CST shall provide a daily summary report indicating total sales, revenue collected, passes sold, amounts of refunds issued and the number of refunds.
- (j) The CST shall support telephone and mail order services.
  - i. All telephone and mail orders filled shall be tracked on a daily basis.
  - ii. The daily orders received and orders filled shall be transferred to the clearinghouse at least once per day per Agency.
- (k) The CST shall have additional capability and memory capacity to record the sales of non-RFCS transactions, such as paper passes, tickets, and transfer data.
  - i. CST shall have the ability to track used, unused, sold, on-hand non-RFCS passes and other fare media in the system by using barcode or manually entered serial numbers.
  - ii. The CST shall support discounting and prorating non-smart card transactions.
  - iii. Non RFCS data is not to be transferred to the clearinghouse.
- (l) The CST shall provide provisions for entering customer information including name address, phone number and ID number.
  - i. The CST shall have the capability to generate customer numbers.
  - ii. The CST shall have the capability to track transactions by customer number, transaction numbers, or pass serial numbers.
  - iii. The CST shall allow Agency personnel to override the standard pass prices, and track and report each override event.

- iv. All CSTs, revalue and information devices/systems shall reference the same customer identification information record, to avoid duplication of records for a specific customer.
- (m) The CST shall record payment method for each sales transaction.

### **11.2.1 Cash Sales**

- (a) The CST shall recognize cash as the default payment method.
- (b) The CST operator shall enter the amount received into the CST using the keyboard (the default value, obtained by pressing enter, shall be the amount due from the customer for the current transaction) and the CST shall encode the fare card.
- (c) In the case of overpayment, the CST shall calculate the change due to the customer, display the corresponding amount on the CST operator interface screen.
- (d) Cash change shall be provided by the operator via the CST cash drawer.

### **11.2.2 Check, Purchase Order, or Money Order Sales**

- (a) Upon receipt of a money order, purchase order (PO) or check for payment, the operator shall either scan the payment through the electronic check reader or manually enter the payment number into the CST using the keyboard.
- (b) The CST shall provide the following features when processing checks and POs:
  - i. The CST shall prompt Agency personnel to enter current ID, such as drivers license and expiration date.
  - ii. The CST shall have the ability to endorse checks and POs electronically listing the deposit information on the back of the payment, at the time the sale is made.
  - iii. The system shall have the ability to create a bad check file.
- (c) The check number shall be verified against the “bad check” and “accepted corporate check/purchase order” files resident in the CST.
- (d) Upon local verification of the check/PO at the CST, the CST shall send a message to the clearinghouse requesting check transaction authorization.

- (e) Such check transactions shall be processed in a manner similar to electronic payment transactions. Upon receipt of authorization, the CST shall notify the Customer Service Representative (CSR) of the check/PO authorization number and transfer value to the fare card.
- (f) Bad check and accepted corporate check/PO files shall be updated at the clearinghouse and downloaded on a daily basis to the CSTs.
- (g) Check transaction processing shall be conducted in accordance with the requirements of the authorizing financial institution/network.

### 11.2.3 Electronic Payment (Credit/Debit/ATM Card) Transactions

The customer shall perform the following steps using an external customer card interface unit:

- i. Swipe the card to be used for payment
  - ii. Select the type of electronic payment, i.e., credit, debit, or ATM card
  - iii. Enter the corresponding account PIN number and press "OK" (debit transactions only)
  - iv. Press "OK" to accept the amount to be charged to the corresponding account
- (a) The CST shall immediately receive the account information read from the card and the CST operator shall forward the transaction authorization request to the clearinghouse by depressing a hot key on the keyboard.
  - (b) The remainder of the transaction shall be processed in a manner similar to that of electronic payment transactions at the ARK, with the exception that a duplicate transaction receipt with a signature line shall be automatically issued by the CST for all credit card transactions.
  - (c) The signed receipt shall be retained in the CST cash drawer for transaction clearing purposes.
  - (d) The CST shall also contain the same provisions as the ARK for the reversal of a credit/debit transaction when the transaction is canceled prior to ticket issuance or card encoding.
  - (e) The processing of all credit and debit transactions shall conform to the requirements of ISO 8583.

**11.2.4 Fare Card Inventory Management**

- (a) When a new fare card is issued and not initialized, the CST shall capture the serial number of the fare card for the clearinghouse.
- (b) The CST shall automatically track the card inventory of the Agency against the clearinghouse card inventory management file as fare cards are sold and initialized.

**11.2.5 Customer Service Agent Sign-On/Off**

- (a) When an Agent signs on, the following procedure shall be followed after turning the CST on with a key. The Contractor shall provide to Program Manager five (5) sets of all CST keys a minimum of 60 days prior to the delivery of the first CST.
- (b) Agent's encoded smart card (Access Card) shall be scanned.
- (c) The following data shall be read from the Agent's Access Card
  - Agent's ID number plus encrypted PIN.
  - Agency code.
  - Expiration date of card.
- (d) This shall be followed by the Agent keying in their PIN. The CST shall compare the encrypted PIN against the PIN keyed in and the CST shall only be operable when the two numbers match.
- (e) The CST shall be set up to automatically record the operator's sign on/sign off PIN and the date/time. The Agent's encoded card shall also be used to sign off. Turning off the key shall disable the CST but not remove the Agent's data. If the first Agent has not signed off, the sign-on of a second Agent shall cause an automatic sign-off for the first operator without loss of any data.
- (f) The Agent shall be able to key in the working cash fund that is available at the start of their shift and to have the CST keep a running balance throughout the shift by accounting for cash received for any cash sales.

### 11.2.6 CST Systems Administration Mode

Through commands entered using the Agent interface such as the keyboard or touch-screen, authorized maintenance and/or revenue service personnel shall be able to place the CST into Systems Administration Mode.

- (a) The CST shall meet the requirements for ARKs Maintenance Mode specified in Section 6.III-10.2.2.3.
- (b) When in Systems Administration Mode, the customer interface display shall read “Out-of-Service” and the operator interface shall be used to enter commands, perform queries, and receive information from the machine on both the monitor screen and on audit.
- (c) The CST shall not be capable of loading value onto a smart card when in the maintenance mode.
- (d) The CST shall return from the Systems Administration Mode to revenue service in the same manner as the ARK does when the ARK door is secured after servicing.
- (e) The presentation of menu selections to facilitate maintenance/revenue service actions at the CST shall be subject to Program Manager approval.

### 11.2.7 CST Training Mode

Through commands entered using the Agent interface such as the keyboard or touch-screen, authorized Agency personnel shall be able to place the CST into Training Mode.

- (a) In Training Mode, the CST shall simulate normal operation including actual display messages
- (b) The CST shall not be capable of loading value onto a smart card when in training mode.
- (c) A record from the time the CST entered Training Mode to the time returned to normal operation shall be created and transferred to the clearinghouse central system during the next scheduled data off load cycle.

## 6.III-11.3 Performance Requirements - CST

Reliability, Accuracy, and Availability shall meet the applicable requirements as stated in Section 6.III-10.3, “Performance Requirements - ARK.”

### 6.III-11.4 Physical Requirements - CST

Figure III-11.1 summarizes required CST modules.

**Figure III-11.1  
CST MODULE SUMMARY**

Module	Reference
Magnetic Card Reader-encoder	X
PIN pad	X
Agent Display	X
Customer Display	X
Card Reader/Writer	X
Keypad/board	X
Printer-Receipt	X
Cash drawer	X
Equipment to Create Photo IDs	X
Card Dispensing Module	X
Data communications	X
Secure Access Module (SAM)	X

“X” denotes module required by Contract

#### 11.4.1 Customer Service Agent Terminal

The Agent terminal shall consist of:

- (a) CPU, based on the latest generation of Intel or Motorola microprocessor or approved equivalent and shall be configured with sufficient memory, data storage, and appropriate communications to meet the functional requirements defined for the terminal.
- (b) Full function keyboard or touch screen interface.
- (c) Minimum a 15 inch standard PC CRT or active matrix LCD monitor. The monitor shall be readable in all ambient light conditions, including both day and night. CST Agent interface shall be subject to the review and approval of the Project Manager (CDRL 8).
- (d) Default selections on the key board or touch screen shall be provided to speed up the transaction process for commonly used transactions.
- (e) Receipt printer.
- (f) Locked cash drawer.
- (g) Equipment to emboss photo identification onto fare cards.

- (h) A card dispensing module shall hold a minimum of 300 cards and shall also be located in a secure lockable housing.
  - i. The cards shall be dispensed in an automatic fashion upon the receipt of payment at the CST for a smart card sales transaction.
  - ii. A means shall be provided for keeping the card stock unexposed and secure at all times outside of card stock replacement actions.
- (i) A customer display to provide the transactional information to the customer.
- (j) The CST Agent interface shall be subject to Program Manager review and approval (CDRL 8).

#### **11.4.2 Customer Interface Unit**

The customer interface unit shall consist of the following:

- (a) Customer data entry/PIN pad connected to the CST via a flexible cable.
- (b) The pad shall be a DES/UKPT encrypting numeric keypad for PIN entry.
- (c) EMV compliant magnetic stripe card reader.
- (d) Privacy hood or shield to protect the privacy of PIN code entry.
- (e) Display to prompt the customer and to indicate the amounts being charged to their credit or debit cards. The display shall indicate that PIN entries are being made with \* but shall not record the characters being entered.

#### **11.4.3 Cash Drawer**

The CST shall provide a uniquely keyed, lockable cash drawer attached to or detached from the CST unit.

- (a) The cash drawer shall be designed and constructed to be pry-proof to prevent unauthorized entry when closed and locked.
- (b) If a separate device from the CST, the cash drawer shall withstand a drop on any corner or side from a height of 2.5 feet onto a concrete floor when containing a full compliment of bills and coins.

- (c) The drop incident shall not cause the cash drawer to open and shall leave the drawer operational.
- (d) The drawer shall contain a removable subdivided tray for currency, coin, checks and other documents received by the operator.
  - i. The tray shall have the capacity to separately store a minimum of 80 bills of each of 4 US currency denominations and a minimum of 60 coins of each of 5 US coin denominations (including SBAs, quarters, dimes, nickels, and pennies) in compartments sufficiently sized for these items.
  - ii. The tray shall also contain two compartments of 4 inches by 6 inches and a minimum of 1 inch deep to accept paper documents.

#### 11.4.4 Receipt Printer

The CST shall include a Receipt Printer as an integral part of the CST or as a stand-alone device that interfaces with the CST through a standard communications port.

- (a) The receipt printer shall include a roll-type receipt paper feed and either a thermal or dot matrix type printer.
- (b) Receipt information shall be software programmable.
- (c) Each Receipt Printer shall be configured to print duplicate receipts with signature lines for credit card transactions.
- (d) Printed characters shall be in black print, smudge resistant when handled immediately by the operator or customer.
- (e) Receipt printing for any type of transaction shall take no longer than 4 seconds.

#### 11.4.5 Photo Identification System

The contractor shall provide the capabilities to print a photo on to special fare cards categories in support of the RRF.

- (a) The photo identification (ID) system shall consist of the following components:
  - i. Digital camera.
  - ii. Application software.
  - iii. Card printer.



- iv. Card lamination unit, if required.
- (b) The photo ID system shall process and print the image on to the fare card at a maximum of five (5) minutes.
- (c) Once the printing process is completed the image shall be smudge proof and permanent for the life of the fare card. The image may be laminated with a clear plastic sheathing as protection.
- (d) The photo ID system shall be able to operate on the CST hardware platform.
- (e) The Agencies have identified the need for the following quantities of the photo ID system:
  - i. Community Transit 1
  - ii. Everett Transit 1
  - iii. King County Metro 2
  - iv. Kitsap Transit 1
  - v. Pierce Transit 4
  - vi. Sound Transit 1
  - vii. Washington State Ferries 0

III

III

**6.III-11.5 Electrical Requirements - CST**

In the event of a power interruption, a rechargeable dry or sealed gel cell battery source (or UPS) shall provide auxiliary power to the CST for a minimum of 10 minutes of full operation. And at the end of the 10 minutes, complete the transaction in progress and allow for orderly shutdown of the CST, including transmitting all audit data and alarm conditions to the clearinghouse.

**6.III-11.6 Environmental Requirements - CST**

CST shall be designed to operate in the environmental conditions provided in Figure III-11.2.

**Figure III-11.2  
OPERATING ENVIRONMENT**

	<b>Customer Service Office Terminal</b>
Temperature Range:	Climate controlled office environment and WSF toll booths
Humidity :	Climate controlled office environment and WSF toll booths
Shock :	Up to 5g horizontal
EMI :	Applicable FCC requirements
Other (dust, grit, rain/water protection) :	Climate controlled office environment

**6.III-11.7 Data Exchange Requirements - CST**

- (a) CST event and transaction data shall be transferred to/from the clearinghouse in the same manner as data for the ARK in Section 6.III- 10.7.
- (b) Data back-up features shall be included to maintain the integrity of all data stored in the CST in the event of system or component failure.

**6.III-11.8 Installation Requirements - CST**

- (a) The Contractor shall install and setup all elements of the CSTs in the designated customer service offices.
- (b) To the extent practical, the equipment shall be secured to prevent theft or damage.
- (c) The Contractor shall make all connections to power and communications, all connections between CST elements, and route all cables neatly and out of the way.

**6.III-11.9 Additional Security Requirements - CST**

**11.9.1 Alarms**

- (a) The CST shall be provided with an alarm that notifies the clearinghouse when an unauthorized entry occurs.
- (b) Both the alarm and method of activation/deactivation shall be subject to Program Manager approval.

**11.9.2 Keys**

The Contractor shall provide to the Project Manager five (5) sets of all CST keys a minimum of 60 days prior to the delivery of the first CST.

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**6.III-11.10 Agency Specific Requirements****11.10.1 King County Metro POS System Integration**

The Contractor shall evaluate the feasibility of integrating existing King County Metro POS hardware and software with the RFCS CST application.

**11.10.1.1 King County Metro Hardware and Operating System**

The King County Metro POS system consists of Intel 486 DX-100 personal computers with 32 MB RAM, operating on MS DOS 6.22. King County Metro is considering migration to a Windows-based system (specific operating system to be determined).

**11.10.1.2 POS Application Software**

The software application is produced by Synchronics, written in MicroFocus Cobol, and the database engine is Pervasive.SQL.

The Contractor shall provide the findings of the feasibility of integration versus replacement of the existing POS system with RFCS CST system.

**6.III-12 DATA COLLECTION SYSTEM****6.III-12.1 Subsystem Description - Data Collection System**

The data collection system shall consist of distributed data acquisition computers (DACs) throughout the region. DACs collect the data from On-Board, Portable and Stand-alone FTPs or other designated RFCS equipment for transfer to the clearinghouse and provide the relevant Agency with duplicate data files of the data files transferred to the clearinghouse.

For those Agencies with multiple bases, the transaction records from each designated base DACs shall be transferred to and consolidated at a DAC Server Computer at the Agency headquarters.

**6.III-12.2 Functional Requirements - Data Collection System**

- (a) The application program shall be easy to operate using a graphical interface.
- (b) The use of proprietary hardware and/or software shall be subject to Project Manager review and approval.
- (c) The DAC shall operate without manual intervention.
- (d) All data up and down loading to the clearinghouse or to On-Board, Portable and Stand-alone FTPs shall be fully automated.
- (e) The DAC clock shall be synchronized with the clearinghouse clock prior to beginning a data transfer.
- (f) Duplicate data records from the CSTs and possibly some ARKs may go to a DAC server computer as well as the clearinghouse.
- (g) The Agency DAC shall allow access to a rolling 90 day database of complete trip transaction records for the Agency through the clearinghouse.
- (h) The DAC Server Computer, if provided, shall up load the consolidated transaction records to the clearinghouse.
- (i) The DAC Server Computer shall not be used as a client application computer.

**6.III-12.3 Performance Requirements - Data Collection System**

- (a) The Contractor shall provide a detailed plan that describes the methodology of capturing and processing the data to be used to measure availability (CDRL 11).
- (b) This plan is subject to Project Manager review and approval.

- (c) The Contractor may add equipment or increase system redundancy levels such as back-up DAC or additional Revalue Devices in order to meet or exceed availability requirements.
- (d) System availability shall be measured at a minimum for the following:
  - i. DAC shall be available to transmit data to the clearinghouse 99.73% and to on- and off-load the data from the FTPs 99.73% during the scheduled time periods for these activities.
  - ii. The combined system elements such as FTP, WDOLS, DAC, and clearinghouse system shall be available 99.73% of the time when they are required for system operations.

### **6.III-12.4 Physical Requirements - Data Collection System**

#### **12.4.1 Data Acquisition Computer**

- (a) The DACS shall consist of standard components, including the latest version of Windows NT or approved equal, on an Intel-Pentium II based platform or approved equal. (DR 39)
- (b) The applications shall be programmed in high order languages such as JAVA, Visual Basic, or C++ and distributed objects.
- (c) Industrial enclosures shall be used as required in hostile environmental conditions.
- (d) Each DAC shall have sufficient hard disk space to hold a minimum seven days of transactions.

#### **12.4.2 DAC Server Computer**

The following is a baseline list of minimum hardware requirements for the DACS Server Computer:

- (a) Industry Standard Computer following IEEE standards
- (b) 256 megabytes of RAM
- (c) 6 gigabyte RAID (level 5) array
- (d) Super-VGA monitor, 17 inch screen
- (e) 101-Key Keyboard and Mouse
- (f) Industry Standard Ethernet Network Interface Card
- (g) Industry Standard Server/Network Operating System Software

- (h) Industry Standard 12 gigabyte Tape Backup system

**6.III-12.5 Electrical Requirements - Data Collection System**

- (a) The requirements specified in Section 6.III-1.5. shall be met.
- (b) In the event of a power interruption, a rechargeable dry or sealed gel cell battery source (or UPS) shall provide auxiliary power to the DAC for a minimum of 30 minutes of full operation; and shall allow for an orderly shutdown of the DAC, including completion of the transmission of all audit data and alarm conditions to the clearinghouse.

**6.III-12.6 Environmental Requirements - Data Collection System**

DAC shall be designed to operate in the environmental conditions provided in Figure III-12.1.

**FIGURE III-12.1  
OPERATING ENVIRONMENT**

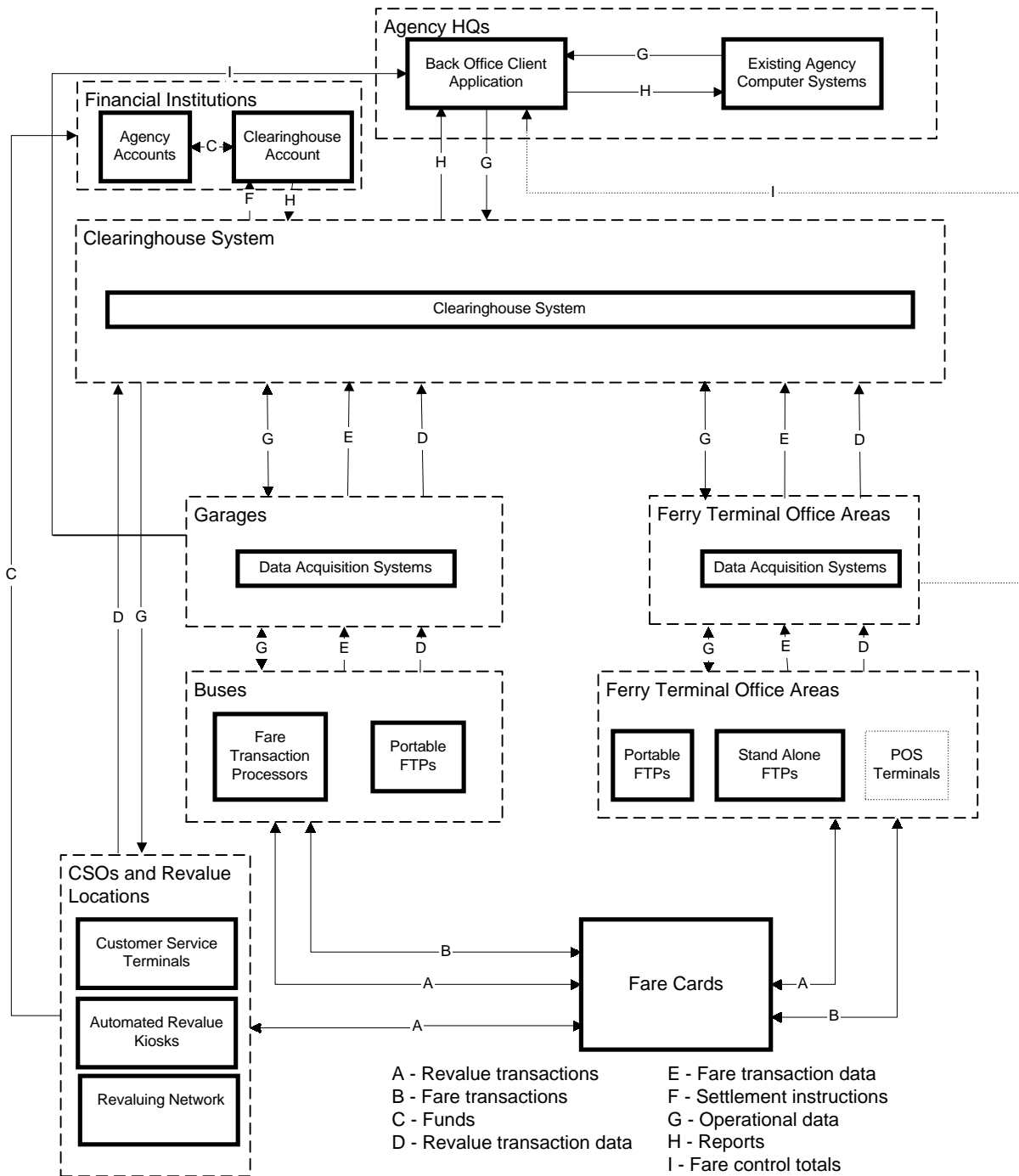
	<b>Data Acquisition Computers</b>
Temperature Range :	Climate controlled environment
Humidity :	Climate controlled environment
Shock :	Up to 5g horizontal
EMI :	Applicable FCC requirements
Other (dust, grit, rain/water protection):	Climate controlled environment

**6.III-12.7 Data Exchange Requirements - Data Collection System**

**12.7.1 RFCS System Architecture**

- (a) The Contractor shall develop a comprehensive RFCS System Architecture, reflecting the interface requirements shown in Figure III-12.2.
- (b) The System Architecture shall include optional or alternative elements to be implemented in the future, as defined in this RFP or proposed by the Contractor.
- (c) The System Architecture shall be submitted with the design documentation and shall be approved by the Project Manager.

**Figure III-12.2  
REVALUE DEVICE AND COMPUTER SYSTEMS  
INTERFACE REQUIREMENTS**



**12.7.2 Data Communications**

- (a) The DACS shall dial into the clearinghouse. Asynchronous communication using File Transfer Protocol (FTP) over TCP/IP at 56 kbps or greater shall be provided.
- (b) Modems shall support ITU-T V.90 and ITU V.90 bis transmission standards, V.90 bis (MNP5) data compression and V.90 (MNP2-4) error correction.
- (c) Under normal operations, all data transmission shall be initiated automatically.
- (d) Uploading of data from designated equipment to the DAC shall occur on a timed poll basis, at a minimum daily, or when equipment memory is at a predetermined threshold level.
- (e) Download of data to designated equipment from the DAC shall occur at Agency pre-determined times of-day. DAC shall have the capability to mirror the FTP displays real time or allow the FTP transaction to be remotely monitored.

**6.III-12.8 Installation Requirements - Data Collection System**

- (a) The Contractor shall install and setup all elements of the DAC in the designated Operating Bases and Agency offices.
- (b) Each Agency is responsible to provide a secure location for the equipment to prevent theft or damage.
- (c) The Contractor shall make all connections to power and communications, all connections between DAC elements, and route all cables neatly and out of the way.

**6.III-12.9 Additional Security Requirements - Data Collection System**

- (a) Every access, authorized and unauthorized, to the DAC shall be logged and reported.
- (b) Data maintained by the DAC shall be protected from loss, manipulation, and/or disclosure through an encryption methodology, such as DES.



**6.III-12.10 Agency Specific Requirements - Data Collection System****12.10.1 Washington State Ferries**

- (a) The Contractor shall provide appropriate environmental enclosures for the DACs that will be located at various WSF terminals and space restrictions may need to be accommodated.

## 6.III-13 BACK OFFICE DATA INTEGRATION

### 6.III-13.1 Subsystem Description

Back office data integration shall include a client application to provide standard revenue and ridership reporting, RFCS system reporting, Agency-specific reporting, ad-hoc query reporting, and fare table update functionality. The client application will provide the primary data interface to the clearinghouse system, and will contain functions for the generation of reports and transfer of data to legacy systems. The client application will also allow consolidated reports to be generated using fare card and non-fare card data transferred both from the clearinghouse system and directly from the data acquisition system (non-fare card data recorded by the FTPs).

The client application shall be designed to operate on a standard PC-based workstation at each Agency (either provided by the Agency or provided under this Contract). Communications to the clearinghouse system shall be via LAN/WAN or other means (e.g., asynchronous dial-up). The Agencies are interested in solutions that leverage off modern client-server or N-tiered application development technology

The Client Application (in conjunction with local server if applicable) shall support the following high level business functions:

1. **Revenue Information and Reconciliation** - This is the information typically needed daily for posting to the Agencies General Ledger application. Some Agencies require categorized totals for manual entry to the GL (e.g., 8 - 10 data points representing sales by pass type, and realized e-purse revenue by fare type). Washington State Ferries requires transaction level data provided in a format that can be imported seamlessly into their existing revenue management system.
2. **Ridership Information and Processing** - This is information on fare card use, provided at the transaction level, or summarized daily, weekly, monthly, quarterly or other period, used by each Agency to report ridership characteristics for local and regional reporting.
3. **System Performance Reporting** - This is information about the performance of the RFCS system including management information reports such as financial management, customer service, marketing, inventory systems operation, and system status/maintenance reports such as fault tracking, exceptions, and support service statistics.

The client application shall include a data export functionality to export/transfer data from the clearinghouse system and DACS to each Agency's legacy revenue and/or ridership systems. This functionality could be implemented via industry standard software techniques such as batch-automation, real-time connectivity, or manual data entry, depending upon the system integration requirements of each participating

Agency. This will allow the Agencies to generate custom reports with their existing back-office systems.

Flexibility and extensibility is also required to allow the creation of new reports, modify existing reports, and administer new types of fare tables to support new fare policies such as distance based fares.

## 6.III-13.2 Functional Requirements

### 13.2.1 Back-Office Client Application

- (a) The client application for the back-office system integration is designed to be the common data-management solution for all participating Agencies. The client application functional requirements shall complement the Agency specific integration functional requirements.
- (b) Except as noted in Section 13.2.2.1 (b) (King County Metro), the Contractor shall be responsible for providing workstation hardware and software for the client application at each Agency.

#### 13.2.1.1 Clearinghouse Data Reporting

The Contractor shall develop reports as specified in 6.III-13.3, Data Exchange and Reporting Requirements. All reports shall be generated by the back-office client application.

#### 13.2.1.2 Agency Specific Fare Table Administration

- (a) The back-office client application shall administer and electronically transfer fare table data to the clearinghouse. The following list of properties is provided as a guideline for the Agency's fare table input, and subsequent transfer to the clearinghouse:
  - i. Unique Fare ID Reference
  - ii. Description String of Fare Type
  - iii. Start Date/End Date
  - iv. Fare Amounts
  - v. Rider Demographic Category fare rules
  - vi. Rider Peak/Off-Peak fare rules
  - vii. Rider Frequency-based fare rules
  - viii. Rider Day-of-Week fare rules
  - ix. Rider Holiday fare rules

- x. Inter-Agency Rider commute fare rules
- (b) The back-office client application shall administer existing fare tables as defined in Appendix A, and shall be extensible to administer new local and inter-system fare tables.
- (c) The back-office client application shall administer a minimum of three (3) fare tables: Prior, current and those for the next fare or service change.
- (d) The client application shall have read-only access to the fare table from the preceding service period.

#### 13.2.1.3 Agency User Administration

The back-office client application shall provide the following user administration functions:

- (a) Add new Agency user
- (b) Update Agency user
- (c) Remove Agency user
- (d) Disable Agency user

#### 13.2.1.4 Agency Application User-Defined Environment Views

The back-office client application shall provide the following user defined environment views:

- (a) Standard User View - Whereby the user will be only able to view a standard Agency operational view of data and application features.
- (b) Standard Power User View - Whereby the user will be able to view a standard Agency managerial view of data and application features.
- (c) Standard Administrator View - Whereby the user will be able to view a standard Agency RFCS back-office integration administrative view of data and application features.
- (d) Customized View - Whereby the user can configure the application to show only user-relevant information in which they are permitted to interact with based on their security clearance level.

### 13.2.1.5 Import/Export Report Data

The back-office client application shall provide the following data import/export functions. All functions shall be available for all report categories specified in 13.3:

- (a) Data Files (Import Source / Export Destination) - This option will include the ability to specify input or output file format including, but not limited to Comma Delimited, User Defined Delimiters, Fixed Field Width, and XML (a tagged data format).  
Note: The XML export option will support the direct republishing of summary information on an Agency Intranet, or the Internet (in the case of information open to the public). Specifications and additional information on XML can be obtained from <http://www.w3.org/xml>.
- (b) DSN Resource (Import Source / Export Destination) - This option will facilitate the transfer of data from the clearinghouse to Agency's local systems. In this function the user shall be able to specify a target Data Source Name (DSN) and table. The system shall accept a user-defined compatible DSN (column count, and data types) for the destination table. The interfaces for this function shall accept user input of any DSN entries configured on the workstation via the Windows control panel, or equivalent workstation interface.
- (c) Printing (Export Destination) - The user will be able to select from a list of printers configured for the client application's operating system. Connection to the printer may either be direct (serial or parallel) or via a local area network (LAN). The client application should take advantage of Operating System print servers to maximize the number of printers compatible with the application.

### 13.2.1.6 RFCS Database Connectivity

- (a) The Contractor shall provide connectivity to the clearinghouse database that meets all the requirements for access and performance described in this document.
- (b) The Contractor shall provide a connection strategy that is consistent with modern wide-area computing technology. Whenever possible the Contractor shall utilize industry standard technology (connectivity hardware, communications protocols, replication technology, etc.).
- (c) The Contractor shall provide failure analysis documentation for the proposed connectivity strategy. This document will address

emergency recovery plan, and emergency (or "off-line") operation procedures.

- (d) The system shall notify the Agency system administrator of communications failures to the clearinghouse system.
- (e) The client application shall not remove, delete or alter data records at the clearinghouse system.

#### 13.2.1.7 RFCS Database Archive Administration

This feature allows archiving of data transferred to the client application; it does not include archiving or modification of data at the clearinghouse system.

- (a) The Contractor shall provide an archive function to provide the Agency with off-line or near-line storage of historical information. The back-office client application shall provide the following database archive functions:
  - i. Agency-specific archive. The system shall allow data to be archived weekly, monthly, and quarterly (3 months) to the target media. The archive scheduling shall be programmable by each Agency.
  - ii. Inter-Agency Archive Subset. This will archive Inter-Agency information to the target media. The Agency may wish to keep Agency-specific historical information on-line longer than Inter-Agency information.
- (b) Records in an archive set shall be flagged or stamped with the current date and time. Incremental archiving shall be provided.
- (c) Each Agency will be responsible for implementing the administrative duties of the archival process. The archive function shall support industry standard media (tapes, disks, CD's) typical for the workstation architecture and operating system.

#### 13.2.1.8 Inter-Agency Data Sharing Filter Administration

The back-office client application shall provide the following inter-Agency data sharing filter administration functions. These are features of convenience, designed to allow the user to display or hide data in a specific view.

- (a) {Display | Hide} All Agency Public records
- (b) {Display | Hide }Specified Agency Public records

- (c) {Display | Hide } Specified Agency Private records
- (d) {Display | Hide } Specified Inter-Agency records

#### 13.2.1.9 Event Logging

The back-office client application shall provide the following event logging functions. The log entries shall occur automatically, and without user intervention:

- (a) Agency Fare Table Administration Events
- (b) Pass Sales Transactions
- (c) Agency User Administration Events
- (d) Batch Scheduled/User Executed Report Generations Events
- (e) Performance metrics for report generation/data sharing events
- (f) Data Import/Export Events
- (g) Database Query Errors
- (h) User Security Events
- (i) Inter-Agency Data Sharing Administration
- (j) Inter-Agency Data Sharing Transactional Events
- (k) Clearinghouse data transactions

#### 13.2.1.10 Local Fare Card Revenue Control Total Reporting

The definition of the control total reporting method is a one to one aggregate comparison between totals from the DACS set of revenue detail records and the totals from the clearinghouse set of revenue detail records for a particular Agency business day. The difference between DACS revenue total and the clearinghouse revenue total is defined as the control total variance. Control totals provide an approximation of fare collection revenues owed to an Agency, but are not expected to represent true revenue owed once all transactions have been reconciled.

- (a) The back office client application shall include functionality to process and report total reconciled and un-reconciled fare card revenue collected at each Agency.
- (b) Reports shall be provided on a daily basis.

- (c) The back office client application shall compare control totals received from the DACS with reconciled totals received from the clearinghouse on a daily basis.
- (d) The back office client application shall create a variance report and report the source of the variance.
- (e) The back office client application shall activate an alarm if a control total variance exceeds a user-defined threshold.

#### 13.2.1.11 Consolidated Fare Card and Non-Fare Card Ridership Reporting

- (a) Some Agencies will collect non-fare card data through the fare transaction processors. The back-office client application shall include functionality to process and generate consolidated ridership reports for all fare card and non-fare card data recorded on the fare transaction processors.
- (b) The back office client application shall include functionality to correct "double counting" of fares that include a fare card underpayment, coupled with a non-fare card "upgrade".

#### 13.2.1.12 Ad-Hoc Reporting

The back-office client application shall include the following ad-hoc reporting functions.

- (a) A graphical interface for the creation of the database query. The user can choose table(s), field(s), conjunctions, conditionals, and output order (ascending or descending). The user can select one or two field(s) for "Group-by" to organize the results in a hierarchy (e.g., report on annual pass sales per month group-by 'sales-location').
- (b) A query editor that allows the user to create a new query using a standard structured language. This same interface may be used to edit a query that was built from the graphical query builder.
- (c) A graphical interface for the creation of the report formats. The user will be able to define page size, margins, footers, headers, page breaks, font size and style, and simple graphical elements.
- (d) A function to save a report design for future execution, or editing.
- (e) A query batch submission service feature, which would enable the Agencies to have query/report results, sent to the submitting Agency via standardized digital media (e.g., DAT tapes). This



service would reduce network bandwidth usage and improve data accessibility.

#### 13.2.1.13 Business Day

- (a) The Contractor shall coordinate the upload and download of data based on each Agency's administrative business day.
- (b) The Contractor shall be able to handle changes to the Agency's administrative business day. This may require coordination with an event triggered by the Agency (as opposed to a time table system).

#### 13.2.2 Functional Requirements (Agency Specific)

The Contractor shall develop the Agency client application to meet the following requirements:

- (a) Provide reports/data for integration into existing Agency reports and databases.
- (b) The client application shall be integrated with the following legacy systems:
  - i. King County Metro, ASCII data file or direct ODBC connection to a workstation to be provided by KCM.
  - ii. Washington State Ferries, ASCII files for import to the POS system, or direct ODBC connection to a workstation provided by WSF.
  - iii. Kitsap Transit, ASCII data file transfer.
  - iv. Pierce Transit, Oracle DBMS and Microsoft SQL RDBMS.
  - v. Community Transit, Oracle DBMS.
  - vi. Everett Transit, no legacy system.
  - vii. Sound Transit, Central Data Collection System (CDCS - under development).
- (c) The Contractor shall coordinate with Agency personnel and other contractors supporting legacy systems as listed in Figure III-13.1.
- (d) The Contractor shall be responsible for developing the client application such that it is compatible and integrated with existing systems.

**Figure III-13.1  
LEGACY SYSTEM SUPPORT CONTRACTORS/PERSONNEL**

<b>Agency</b>	<b>Contractor</b>
King County Metro	KCM staff
Washington State Ferries	Compaq Computer Inc. (formerly Digital Equipment Corp.)
Kitsap Transit	KT staff
Pierce Transit	PT staff
Community Transit	To be determined at implementation
Everett Transit	Solutions for Government (SFG) and City staff
Sound Transit	To be determined at implementation

#### 13.2.2.1 King County Metro

- (a) Daily sales reports shall be provided to the Finance Department for manual entry to the general ledger. Sales information will be broken down by pass type and by vendor identifier (e.g., Consignment, Group Sales, RFCS managed sales). Transaction revenue (from stored value) will be broken down by Peak, Off-Peak, and Special fares (Senior, etc.).
- (b) The client application shall be installed on a workstation to be provided by King County Metro.
- (c) Transaction level Ridership data shall be provided through electronic data transfer to KCM workstation. This requirement could be met by the Import/Export Report requirements using either ASCII file export as an intermediate step, or direct ODBC transfer if the KCM Transit Distribution Database supports this.
- (d) Currently, KCM's administrative business day is defined as 8 a.m. to 5 p.m. KCM maintains a separate "service day" for transit operations.

#### 13.2.2.2 Washington State Ferries

The WSF primary goal is to minimize requirements for modification of existing Point of Sale (POS) and associated revenue management and traffic statistics systems for Stage 1 implementation.

- (a) Requirements for Stage 1 Back-Office Integration are:
  - i. All fare transactions created during the WSF business day (4:00 a.m. to 3:00 a.m.) shall be downloaded to WSF POS

system in a single batch. The download must include a complete POS terminal record set (All appropriate tables, with referential integrity fields correctly linked)

- ii. All records shall be of transaction-level detail and will be used by the POS system to generate predefined POS system reports. Transaction-level data will also be transferred to other WSF and Washington State Department of Transportation legacy systems from POS.
- (b) The information from the RFCS will appear as additional records from existing (or set of existing) POS terminals reporting daily sales in a manner consistent with the actual POS terminals. WSF will use the RFCS data in combination with their real terminal uploads to generate Revenue and Ridership reports from the POS back end.
  - (c) Attached as Appendix E-6, is the WSF POS Requirements Document. The daily RFCS download will need to emulate Sales Transaction Table record entries, and the associated Ticket Log, and Payment Log records. The transfer format shall be one ASCII file per table as represented in the appendix. The set of files can contain records from multiple terminals assuming all referential integrity links are maintained. An option (less desirable) is the clearinghouse downloads one set of files per terminal per day.
  - (d) WSF must have all business day transaction information prior to batch processing of the transactions. The batch process runs automatically after the last Terminal Agent (supervisor) has closed their previous business day, and transfers data to multiple WSF and WSDOT systems including the accounting and traffic statistics systems. All RFCS data associated with the previous business day must be received before the WSF batch processing can be run. There is no opportunity to integrate this information after the batch processing has been completed.
  - (e) Currently, WSF's business day is defined as 4 a.m. to 3 a.m.

#### 13.2.2.3 Kitsap Transit

- (a) Daily revenue reports from the RFCS system shall be provided by fare type. These will be manually entered into the existing Fundware general ledger system.
- (b) On a daily basis, ridership data from the client application shall generate a formatted ASCII data file via the client application data export feature. This data file/ODBC connection data shall be imported into an existing Microsoft Excel system.

- (c) At the time this specification was written, a final decision about a new accounting system had not been made. The most likely product under consideration is "Fundware for NT". The Contractor shall provide functionality to export data to this product
- (d) Currently, KT's administrative business day is defined as 8 a.m. to 5 p.m.

#### 13.2.2.4 Pierce Transit

- (a) RFCS revenue data shall be transferred to the existing finance system via ODBC type middle-ware, or by transfer command in the back office client application.
- (b) The current finance system is mainframe-based, however Pierce Transit is in the implementation stage to migrate existing financial systems to an Oracle RDBMS. This will be completed before the RFCS is implemented. The Contractor shall confirm the integration approach as part of System Design. As a result of the Agency's changing state of its IT infrastructure, the Contractor shall provide functionality in the Ad-Hoc reporting feature sufficient for the creation of custom Agency revenue and ridership data sets transferable via ASCII data file or ODBC connection.
- (c) Currently, PT's administrative business day is defined as 8 a.m. to 4:30 a.m.

#### 13.2.2.5 Community Transit

- (a) Community transit is implementing a new ERP system based on Oracle financial packages, using Oracle 7.3.n or Oracle 8 as the back-end. The client application shall interface with this system. Via ODBC connection.
- (b) The Contractor shall provide daily revenue reports broken down by fare and pass types. These numbers will be manually entered into the GL system.
- (c) Community Transit has contracts with third-party transit providers, who are responsible for their own revenue reporting. The back-office client application shall report all third party fare card revenue, summarized by provider.
- (d) Currently, CT's business day is defined as 8 a.m. to 5 p.m.

### 13.2.2.6 Everett Transit

- (a) Daily reports from the RFCS system shall be provided summarizing sales by fare type. These will be manually entered into the existing financial systems. Currently, Everett Transit hosts a legacy COBAL financial system called SFG. They also use Microsoft Excel to aggregate revenue and ridership data. Everett Transit has no current plans to upgrade their existing systems.
- (b) Currently, ET's administrative business day is defined as 8 a.m. to 5 p.m.

### 13.2.2.7 Sound Transit

Sound Transit (ST) is implementing an Automated Fare Collection system that will eventually become integrated with the RFCS (that system is not currently deployed). ST's system will collect fare data from ticket vending machines and validators, and transfer that data to the Central Data Control System (CDCS). The CDCS will provide the ST interface with the client application and clearinghouse system.

Sound Transit will also be installing fare collection (farebox and RFCS fare card) equipment on new bus services.

- (a) The RFCS Contractor shall coordinate with the ST Contractor to provide the necessary information to integrate the ST system into the RFCS. The ST Contractor will be responsible for making any necessary modifications to the CDCS to accommodate the upload of information from CDCS to the RFCS clearinghouse.
  - i. The RFCS Contractor shall provide ST with the application software to transfer RFCS transaction data from the CDCS to the clearinghouse system.
  - ii. The RFCS Contractor shall provide ST with the software drivers and RFCS card application for the TVM card readers.
- (b) The RFCS Contractor shall provide to ST the transaction data format required to complete modifications to CDCS for transaction uploads to the clearinghouse. Refer to Appendix E-5 for a preliminary list of messages. These messages are subject to change as Sound Transit implements its Ticket Vending Machine project.
- (c) Currently, ST's administrative business day is defined between 6 a.m. to 12 a.m.

### 13.2.3 RFCS Client Application Support

- (a) The Contractor shall provide on-site technical services necessary to fulfill the functional requirements of each Agency's back-office functions connected with the RFCS system.
- (b) The Contractor shall provide scheduled and emergency on-site maintenance of the client application.

### 6.III-13.3 Data Exchange and Reporting Requirements

- (a) The RFCS shall provide the following minimum data exchange and reporting between the clearinghouse and each Agency's existing revenue and ridership systems:
  - i. Standard System Performance
  - ii. Standard Ridership and Revenue
  - iii. Ad-hoc Ridership and Revenue
  - iv. Agency-Specific Ridership and Revenue
- (b) All reports shall be generated using a query language and standard query engine (to be approved by the Project Manager) that provides for the greatest flexibility for future updates, and for creation of new reports.
- (c) Report writer software shall include the ability to generate graphs and charts based on criteria and format defined by the user.
- (d) All reports shall be generated with configurable time parameters, including as a minimum annual, monthly, weekly, daily and with user defined start-end date ranges.

#### 13.3.1 Standard System Performance Reporting

As a minimum, the RFCS shall generate the following standard system reports monthly, quarterly and annually (CDRL 41):

- (a) Financial management reports, including as a minimum:
  - i. Sales reports by end point (ARK and other devices in the revalue network, CSO, FTP, clearinghouse system)
  - ii. Sales by payment type
  - iii. Failed transaction reports
  - iv. Card account activity reports
  - v. Daily settlement and reconciliation reports
  - vi. Daily financial activity summaries
  - vii. Cash management reports, including cash position

- viii. Financial trend analysis
- (b) General management information reports, including as a minimum:
  - i. System utilization reports
  - ii. Card management performance statistics, including card failures
  - iii. Systems operations reports
  - iv. Fraud management reports
- (c) Contractor provided customer service reports, including as a minimum:
  - i. Call center level of service and performance against quality standards
  - ii. Mail center performance against quality standards
- (d) Institutional program reports, provided to both the Agencies and institutions, including as a minimum:
  - i. Summary reports on overall program participation, by fare media and Agency
  - ii. Card account transaction history (monthly or other pre-arranged schedule)
  - iii. Billing and revenue account status
  - iv. Vanpool subsidies (to be reported to the vanpool administrator at each Agency)
- (e) Contractor provided marketing reports, including as a minimum:
  - i. Card usage statistics and trend analysis by customer market
  - ii. Summary of marketing program activities (monthly)
  - iii. Performance against identified measures for Agency and Contractor components of the marketing program
- (f) Inventory management reports, including as a minimum:
  - i. Card procurement and central inventory
  - ii. Ordering and inventory at each point in the distribution network
  - iii. Delivery performance
- (g) System maintenance reports(CDRL 34), including as a minimum:
  - i. System-wide inventory report

- ii. Summary fault tracking report
- iii. Technical support service statistics
- iv. Extended maintenance reports
- v. Daily exception summary report

### **13.3.2 Standard Fare Card Ridership and Revenue Reporting**

#### **13.3.2.1 FTA Section 15 Reporting (CDRL 42)**

- (a) The RFCS shall generate unlinked passenger trip reports for each Agency. Reports shall contain:
  - i. Annual unlinked trip totals.
  - ii. Average weekday, Saturday and Sunday unlinked trip totals.
  - iii. Unlinked trips by mode including motor bus, trolley bus, vanpool, rail, and demand responsive services.
- (b) The RFCS shall generate passenger fare reports for each Agency. Reports shall contain:
  - i. Total passenger fares.
  - ii. Fares by fare category, including as a minimum full-fare (adult), senior citizen, student, special fares.
  - iii. Fares by mode, including as a minimum motor bus, trolley bus, vanpool, rail, and demand responsive services.

#### **13.3.2.2 Common Ridership and Revenue Reporting (CDRL 43)**

The RFCS shall generate the following ridership and revenue reports for each Agency.

- (a) Monthly summary ridership reports, broken down by:
  - i. Route.
  - ii. Fare category (per the fare categories of each respective Agency).
  - iii. Fare payment type (stored value, each type of pass).
  - iv. Average weekday ridership.
  - v. Average Saturday ridership.
  - vi. Average Sunday ridership.
  - vii. Unlinked trips.



- viii. Linked trips (transfers) within Agency public transportation services.
  - ix. Linked trips (transfers) to other Agency public transportation services.
- (b) Daily ridership reports, broken down by:
- i. Route.
  - ii. Fare category (per the fare categories of each respective Agency).
  - iii. Fare payment type (stored value, each type of pass).
  - iv. Unlinked trips.
  - v. Linked trips (transfers) within Agency public transportation services.
  - vi. Linked trips (transfers) to other Agency public transportation services.
- (c) Monthly fare media in use summaries, broken down by:
- i. Stored value or pass type.
  - ii. Current month fare cards in use.
  - iii. Comparison with previous month
  - iv. Average weekly fare cards used on a each Agency's service.
  - v. Year to date fare cards used on each Agency's service.
  - vi. Comparison with previous year.
- (d) General daily, weekly, monthly, and year to date revenue reports, broken down by:
- i. Agency-specified revenue account.
  - ii. Stored value transactions.
  - iii. Pass sales/revalues.
  - iv. Funds transfers.
  - v. Comparison with previous month (monthly only).
  - vi. Comparison with previous year.
- (e) Pass sale/revalue summaries, broken down by:
- i. Sale/revalue location identification.
  - ii. Pass type.

- iii. Payment method (cash, credit, debit, funds transfer, purchase order, other).
- (f) Monthly fare underpayment summaries, broken down by:
  - i. Fare card identification
  - ii. Fare type (stored value, type of pass).
  - iii. Route or terminal identification.
  - iv. Bus operator, seller, or inspector identification.
- (g) General accounting reports, including as a minimum:
  - i. Accounts receivable.
  - ii. Accounts payable.
  - iii. General ledger.
  - iv. Accounting data by Agency specified revenue accounts.

### **13.3.3 Ad-Hoc Fare Card Ridership and Revenue Reporting**

Through the back office client application, the RFCS shall provide each Agency with the ability to prepare ad-hoc reports (CDRL 44) including as a minimum:

- (a) Transaction-level reports for user-defined start and end points, including as a minimum the following fields or subset thereof defined by the user:
  - i. Route ID
  - ii. Run ID (bus and rail)
  - iii. Trip ID (bus and rail)
  - iv. FTP ID, with bus or terminal cross-reference
  - v. Bus operator, WSF seller, or ST fare inspector ID
  - vi. Date of transaction
  - vii. Time of transaction
  - viii. Amount or value of transaction
  - ix. Valid fare payment or underpayment
  - x. Linked or unlinked trip
  - xi. Agency transferring from (if applicable)
  - xii. Route or terminal transferring from (if applicable)
  - xiii. Run transferring from (if applicable)

- (b) Statistical and research reports using user-defined criteria. Examples include:
  - i. Usage characteristics for user-defined customer market segments, potentially broken down by type of fare payment used (stored value or type of pass), geographic area or route, period of travel, and/or frequency of travel.
  - ii. Pass type used versus fareset.
  - iii. Card revalues by geographic area or revalue location.

### 13.3.4 Agency Specific Fare Card Ridership and Revenue Reporting

In addition to the standard and ad-hoc reports, the Contractor shall provide the following Agency specific reports (CDRL 45). Sample report formats are contained in Appendix E. Except where noted, the Contractor may provide alternative report formats, subject to approval by the affected Agencies. Data for Washington State Ferries must be provided in the exact format specified for integration with their existing systems.

#### 13.3.4.1 King County Metro

The Contractor shall provide data exchange for the preparation of the following KCM-specific reports. Samples of King County reports are provided in Appendix E-2.

- (a) Revenue Passenger Trips Reports (Monthly)

Reports for two fare category types: Stored Value (monetary valuation) and period pass. The Contractor shall provide data exchange support data below as required by this report:

- i. Actual Weekly/Monthly Revenue
  - ii. Actual Current Year-to-date Revenue
- (b) Current Year vs. Previous Year: Comparison of the number of passes in use (Monthly)

The Contractor shall provide monthly and year-to-date totals for all fare card stored value and pass transactions.

This monthly report shall be broken-down by fare category types, and shall show the following specific views of rider data relative to each transaction type\_ :

- i. Current Month's total passes in use
- ii. Current Month's Year-to-date total passes in use

(c) Daily Passenger Rides (Monthly)

The Contractor shall provide daily totals for all fare card stored value and pass transactions. This monthly report shall be broken-down by day of month and day of week, and shall show the total number of rides per day for each category of transaction.

(d) Fare Media in Use and Sales Report (Monthly)

The Contractor shall provide daily totals for all fare card stored value and pass transactions.

This monthly report is a series of reports designed to illustrate the outstanding fare media (pass) that are in use and sold for the month. The Comparison of Passes in Use (Appendix E-2) illustrate the need to support the data exchange requirement of the different types of pass functions that may be need to be supported by the RFCS system. The Contractor shall provide report information in the same format.

#### 13.3.4.2 Washington State Ferries

- (a) The Contractor shall upload all transaction records for a specific WSF business day to the WSF POS system.
- (b) Transaction records shall be formatted in the exact format as existing POS data and tables, using the table structure identified in Appendix E-6.
- (c) WSF-specific revenue and traffic reports will be generated by the POS and associated systems.

#### 13.3.4.3 Kitsap Transit

The Contractor shall provide data exchange to enable Kitsap Transit to generate the following reports.

(a) Passenger Totals (Daily)

This is a sample of driver shift report. This report deals with rider "head count" over the span of the driver's shift. This level of information shall be maintained by the RFCS.

(b) Ridership Recap (Monthly)

The Contractor shall provide data exchange support for the number of riders year-to-date and broken down by weekdays, Saturday, or

Sunday routes. This report illustrates requirements for year-to-date rider counts (Appendix E-3).

- (c) Saturday Service- Routed Service Monthly Performance Report (Monthly)

The Contractor shall provide data exchange support for the number of riders by route location and total passengers for the location for the specific month. This report illustrates requirements for monthly ridership route counts for day-of-week specific routes only.

- (d) Routed Service Monthly Performance Report (Monthly)

The Contractor shall provide data exchange support for the number of riders by route location and total passengers for the location for the specific month. This report is the more generalized form of the previous report, stated above (Appendix E-3).

- (e) Comparison Report of Routed Service Routes (Monthly)

The Contractor shall provide data exchange support for the ridership information by Route/ by Month, and report and compare the previous years information (after the system has been running for a year).

#### 13.3.4.4 Pierce Transit

The Contractor shall provide data exchange to support the preparation of the following reports:

- (a) Revenue and Ridership Reporting (Monthly, Quarterly and Year End)

The Contractor shall provide a comma delimited ASCII file compatible with the Average Daily Ridership report described in Appendix E-4. The first two (2) pages of E-4 contains a sample report that shows how Pierce Transit breaks up bus fleets, and route categories. This is provided for illustrative purposes, but does not include the full range of fields that will be required for RFCS implementation.

The Contractor may fulfill this functional requirement by providing revised documentation that describes Back-Office Client export instructions, and Excel import instructions, or may provide an alternative method (subject to Agency approval) that fulfills the reporting requirements.

(b) Wheelchair Lift and Bicycle Report (Daily and Monthly)

The Wheelchair Lift report shows wheelchair lift utilization by fleet type (boardings only). This information is manually counted by drivers via the farebox keypad, and reported using an Excel spreadsheet. The same method is also being used to track the volume of bicycle boardings by route and fleet type.

The Contractor shall provide similar reports for wheelchair lift and bicycle boarding information keypunched into the FTP by the driver.

(c) Average and Peak Reports (Daily and Monthly)

i. The Contractor shall provide information to support the creation of the following charts. Peak ridership is the average (over multiple days) of the maximum number of passenger boardings in a specified time period.

- Average Weekday Ridership
- Average Saturday Ridership
- Average Sunday Ridership
- Seattle Express Northbound Peak
- Seattle Express Southbound Peak

Examples of these charts have been provided in Appendix E-4.

ii. The Contractor shall provide reports on average and total passenger boardings by trip number and route. This may be included as part of the Common Ridership and Revenue Reports described in 13.3.2.2.

(d) Pass Distribution/Reconciliation (Monthly)

This report contains monthly information by revenue categories, and totals by pass, or fare type. The RFCS may cause some pass types to be obsolete, and may add new types to the report. An example is contained in Appendix E-4.

(e) Pass/Ticket Sales Information (Monthly)

This report presents daily sales counts of pass sales. There is one edition of this report for every sales outlet. The information on this report is summarized in the next report "Pass Distribution/Reconciliation". The example report is an excellent resource for

Pass Types that the system shall support for integration with Pierce Transit.

(f) Pass Distribution/ Reconciliation (Monthly)

This report shows totals by pass type by sales outlet. This report summarizes the daily information provided in the Pass/Ticket Sales report described immediately above.

#### 13.3.4.5 Community Transit

The Contractor shall provide data exchange support for the following reports:

(a) Monthly System Performance Report (see example in Appendix E-1).

The report requires the following information totaled by route and performance center for weekdays, Saturdays, Sundays:

- i. Number of passenger boarding.
- ii. Payment type (cash purse, period pass, transfer) and amount.
- iii. Pass type (CT local, CT commuter, regional employer, U-Pass).
- iv. Fare category (senior, youth, disabled).
- v. Number of transfers to/from other transit systems and the associated routes.
- vi. Number of internal linking transfers at the route and performance center level.

(b) Provider Reports:

This category is required for CT to support their existing business practice of multiple service contracts. The Contractor shall provide quarterly ridership and revenue summary reports for each contracted service provider.

(c) Financial Reports:

- i. Sales by retail/kiosk location, including the total of each category of item sold.
- ii. Interest earnings with a brief description of the computation.
- iii. Cash receipts received by invoice number for each specific employer.

- iv. Sales by performance center.
- v. Sales by provider (Contractors).
- vi. Summary of cash receipts by category that reconciles with the daily total cash receipts.

#### 13.3.4.6 Everett Transit

- (a) The Contractor shall provide data exchange support for ET's GL interface.
- (b) The Contractor shall obtain a data dictionary from Everett Transit and finalize data exchange needs.
- (c) The Contractor shall develop the data interface in mainframe interface description language.

#### 13.3.4.7 Sound Transit

The Contractor shall provide data exchange for the preparation of reports by ST's CDCS per the data requirements contained in Appendix E-5. Additional data exchange and financial reporting requirements for Sound Transit, beyond the standard reports, is currently under review.

#### 13.3.5 Non-Fare Card Transaction Reporting (CDRL 46)

- (a) At the direction of each Agency, the reports listed in Sections 13.3.2, 13.3.3 and 13.3.4 shall include and consolidate non-fare card data collected through the fare transaction processor and data acquisition system.
- (b) Non-fare card data shall be listed as one or more additional fare types. As a minimum, a "cash" fare type shall be included.

### 6.III-13.4 General Computing Environment

The intent of this section is to illustrate general industry guidelines and Agency preferences for hardware and operating system software. It is also the intent of this section to include, and not limit this application to, a multitude of application technology solution types for the Agency Back-office Integration.

- (a) The Contractor shall provide a back-office solution that is compatible with the computing environment of each Agency.
- (b) The Contractor shall provide the exact specifications for new systems to be integrated with legacy systems to the Agencies and their designates, including other Contractors responsible for legacy systems.



- (c) The Contractor shall provide a means for users to manage processes or sub-processes (threads) of the client application. This requirement may be fulfilled by using native operating system utilities to monitor, pause, or terminate lengthy processes as needed.

#### **13.4.1 Back-Office Client Application Computer**

- (a) The Back Office Client Application Computer shall meet the following minimum standards, and shall be approved by the Project Manager:
- i. Industry standard CPU, operating at the upper range of currently available technology at the retail level >300 MHz
  - ii. 128 megabytes of RAM
  - iii. 4 gigabyte hard drive; 10 ms or better seek time, 200,000 hours or better MBTF
  - iv. Super-VGA monitor (17" screen minimum)
  - v. 101-Key Keyboard and mouse
  - vi. Industry standard archive system
  - vii. 10/100 Mb/s Ethernet network interface card with RJ-45 connectors
  - viii. Windows 95, Windows 98 or Windows NT
  - ix. TCP/IP network protocol
- (b) Data back-up and redundancy shall be provided to protect against data loss.

### **6.III-13.5 Performance Requirements**

#### **13.5.1 Back-Office Client Computer**

- (a) Upon database query, print, or any other application function, the application shall return control to the user within five (5) seconds of initiation.
- (b) All transactions shall be successfully processed.

#### **13.5.2 Data Transfer and Report Generation Response Time**

- (a) Fare Table Updates: Fare table transfer to the clearinghouse system shall be completed in less than ten (10) seconds.
- (b) Standard Reports: Standard reports shall be generated in less than ten (10) seconds (this does not include the printer time to complete the output).

- (c) Ad-Hoc Reports: Ad-hoc reports shall be completed in less than fifteen (15) seconds. (This does not include report design time, the report layout "Save" operation, or printer time to complete the output).

"Complete" is defined as - "Full control of the workstation has returned to the user". Background processing strategies may be implemented to fulfill response time requirements.

### **13.5.3 Reliability and Accuracy**

- (a) Reporting process: All reports shall perform the correct calculations for sub-totals, totals, and summary information (all derived information) with 100% accuracy. The underlying standard report design (including mathematical formulas) shall be available to the Agencies for review.
- (b) Fare table updates: The Back-Office Client shall correctly transfer the Fare Table revisions to the clearinghouse system with 100% accuracy.
- (c) Transaction recording functions: The Back-Office Client shall correctly store information into the clearinghouse database with the appropriate field and form level validation.

### **6.III-13.6 Installation Requirements**

- (a) The client application and all of its supporting hardware and software shall be installed by the Contractor. At each Agency's discretion, Agency personnel may perform the installation
- (b) The Contractor shall design and develop a simple to use installation program for the client application software. This program should be designed so that non-technical staff may install the client application. The instructions for installation may include directions for requesting network connections, and login accounts from application, or network administrators.

### **6.III-13.7 Additional Security Requirements**

The Contractor shall provide the following additional requirements:

- (a) All direct access to clearinghouse system data shall be read-only, except for Fare Table updates.
- (b) For the client application, the Agencies shall have the ability to assign access privileges to their employees for processing of data downloaded from the DACS or clearinghouse system to the local RFCS back-office client application.

Employees shall not be able to modify fare card data to be forwarded from the DACS to the clearinghouse system.

- (c) All query operations, audit control logging, and errors on the client application shall be logged in a separate ASCII file or database.

### **6.III-13.8 Documentation Requirements**

#### **13.8.1 Back-Office Client Application**

The following documentation for the back-office client application shall be provided.

- (a) Agency Operations Manual
- (b) System Administration and Installation Manual
- (c) User Manual

#### **13.8.2 Back-Office Integration (Agency-Specific)**

The following documentation shall be provided describing the integration at each Agency:

- (a) System Integration Architecture Diagrams and Documentation
- (b) System Installation Procedures
- (c) System Maintenance Procedures
- (d) System Performance Monitoring Strategy and Procedures
- (e) System Test Plans and Procedures
- (f) Emergency Technical Support Procedures
- (g) Bug-Fix Reporting and Software Service Pack Release Request Procedures

## 6.III-14 NON-FARE APPLICATIONS

### 6.III-14.1 Description

The Agencies have identified two non-fare applications (CDRL 47) to be included as part of the Regional Fare Coordination System. These are designed to meet near term business, operational and technical needs, as well as demonstrate the extension of core RFCS services and technologies to non-fare related applications.

The Contractor shall provide the following non-fare applications:

- (a) A Parking Revenue Collection System (PRCS) for Pierce Transit, to be installed at the Tacoma Dome Station Parking Garage. Detailed requirements for the PRCS are contained in Appendix F-2.
- (b) A food and sundry purchase system on Washington State Ferries vessels.

### 6.III-14.2 General Requirements

- (a) All non-fare applications shall utilize RFCS smart card technology.
- (b) Non-fare applications shall not impact the functionality of the transportation application.
- (c) Non-fare applications shall not impact the performance of the transportation application.
- (d) Non-fare applications shall be extensible to other sites, other similar applications, and other agencies.

### 6.III-14.3 Parking Revenue Collection System

#### 14.3.1 Functional Requirements

- (a) The parking revenue collection system shall meet all functional requirements contained in Appendix F-2.
- (b) The Contractor shall provide the following parking revenue collection system card configuration options on a single card:
  - i. Parking revenue collection system application only.
  - ii. Parking revenue collection system application and RFCS transportation application.
- (c) The parking revenue collection central equipment shall be expandable to include the future addition of other parking facilities.

- (d) The parking revenue collection system shall be extensible to other Agencies.

#### **14.3.2 Performance Requirements**

- (a) The parking revenue collection system shall meet all performance requirements contained in Appendix F-2.

### **6.III-14.4 Food and Sundry Payment System**

#### **14.4.1 Functional Requirements**

- (a) The Contractor shall provide a food and sundry payment system on Washington State Ferries vessels.
- (b) The food and sundry payment system shall be used for purchases from the on-board concessionaire.
- (c) The Contractor shall supply all equipment and facilities required for the food and sundry payment system including as a minimum:
  - i. Card reading equipment co-located with all existing cash registers.
  - ii. Communications/data transfer system.
  - iii. Data management systems.
- (d) The Contractor shall make all arrangements with the on-board concessionaire to support the food and sundry payment system including as a minimum:
  - i. Installation, operation and maintenance of equipment.
  - ii. Revenue management.
  - iii. Revenue reporting.
- (e) The system shall provide functionality to block/unblock the food and sundry payment application at the discretion of the cardholder.

#### **14.4.2 Performance Requirements**

- (a) Transaction time for food and sundry purchases shall be a maximum of three (3) seconds.
- (b) Customers shall not be required to enter a personal identification number or other information for purchases.

## 6.III-15 SYSTEM EXPANSION AND POTENTIAL FUTURE APPLICATIONS

### 6.III-15.1 Description

The following are examples, provided for background information only, of the types of future potential RFCS smart card applications that have been identified to date. These specific applications will not be evaluated in the Contractor selection process. With these types of applications to consider, the Contractor should describe in general terms the characteristics of its system architecture, card design and operating policies which would allow for additional non-RFCS applications to the RFCS card. The system proposed will be evaluated and scored based on its capability to expand and incorporate future, additional applications.

#### 15.1.1 King County Access Identification and Access

This includes integrating the RFCS card with existing building identification and access systems for four (4) existing and four (4) future King County building and garage facilities. Estimated card and reader quantities and technical information on existing identification and security systems is contained in Appendix F-1.

#### 15.1.2 Car Sharing Program

Car sharing, a proposed program to be co-sponsored by King County Metro, the City of Seattle, and the University of Washington would provide access to automobiles without the costs and hassles of auto ownership.

Car sharing is similar to typical car rental services; however, vehicles are parked within walking distance of home or work and billing is based on an hourly rate, rather than a daily rate. Reservations are made by phone and fees are based on time and miles driven. There is typically an initial refundable deposit to subscribe to the service. All insurance is included in the mileage and hourly rates. For more detail on how the program works, see the King County Metro website:

[http://transit.metrokc.gov/travel\\_options/carshare.html](http://transit.metrokc.gov/travel_options/carshare.html)

Kitsap Transit is also interested in a car sharing type program. For example: if a person commuting by ferry to Seattle works late and returns to Kitsap County after transit service has ended for the day, cars accessible with the smart card would be available for their use.

#### 15.1.3 City of Seattle “City Card”

The City of Seattle is considering the development of a “city card” based on European models where citizens have a card to access various city

services and benefits and pay utility bills, parking tickets, parking meters, pet licenses, garbage stickers, etc. as well as link to regional transit systems, monorail, car sharing, and guaranteed ride home services. Additionally, in return for performing community service Seattle residents may get benefits such as purchase of discounted tickets at publicly-subsidized facilities like the aquarium and the zoo, discounted purchases at stores, credit on City utility bills, et al. The Seattle Smart Card would be available only to Seattle residents, providing an attractive transportation and civic benefit for people who live in Seattle.

#### **15.1.4 Transit Oriented Development – Fare Incentives and Secured Access**

King County plans to use smart card technology to provide transit pricing incentives for residents at Transit Oriented Development (TOD) sites, and for secure parking and building access at these sites. In January, 1998, King County launched a new TOD program to create opportunities for new multi-family housing and related development near bus transit facilities in its urban centers. The two (2) primary goals of this program are to increase bus ridership and to achieve a greater jobs/housing balance in the region by creating communities where public transportation use is convenient. King County has issued a request for proposals for three (3) pilot projects for this program – downtown Renton, Northgate and Overlake, and is in the process of issuing a fourth for the Olson Myers Park and Ride.

### **6.III-15.2 King County Identification and Building Access**

#### **15.2.1 Functional Requirements**

- (a) The Contractor shall provide an identification and building access system for the following King County building and garage facilities:
  - i. The Regional Justice Center located in Kent, Washington.
  - ii. Three existing King County facilities in downtown Seattle including the Courthouse, King County Administration Building, and Administration Building Garage.
  - iii. A new King County facility on King Street in Seattle, currently under construction and scheduled for occupancy in June 1999.
  - iv. Three future King County facilities including the Yesler building in downtown Seattle, Ryerson Transit Base, and the District Court in Issaquah.

Information on the equipment at each facility is contained in Appendix F-1.

- (b) The Contractor shall supply the cards, readers, and all other systems and equipment required for the identification and building access system. The total estimated number of cards is 15,000. The total estimated number of readers (not including spares) is 148. Equipment information can be obtained from the manufacturer's Internet web sites as listed in Appendix F-1.
- (c) The identification and building access card shall be inter-operable across all facilities, subject to individual access permission.
- (d) The Contractor shall provide the following identification and building access card configuration options on a single card:
  - i. Identification and building access application only.
  - ii. Identification and building access application and RFCS transportation application.
- (e) The Contractor shall be responsible for integrating new equipment and services with existing central monitoring, control, network management, and reporting systems.
- (f) New equipment and services shall be compatible with existing communications and electrical supply.
- (g) Cards issued for identification and building access shall include magnetic stripe, bar code and dye sublimation compatible with the existing systems.
- (h) The contractor shall provide equipment at each facility to imprint photographs and employee identification information.

### **15.2.2 Performance Requirements**

- (a) New equipment and systems shall not impact the performance of existing central monitoring, control, network management and reporting systems.
- (b) New equipment and systems shall meet or exceed all current data storage and processing performance measures.

## **6.III-15.3 Car Sharing Program**

### **15.3.1 General Requirements**

RFCS cards could be used to perform the following functions of the car sharing service:



#### 15.3.1.1 Access to Vehicles

The card would act as the subscriber's ID card. The on-board access control system would recognize the user as the correct subscriber and allow access into the vehicle. Subscribers gain access to the vehicle by holding their card next to an access device located on the front dash of the car.

#### 15.3.1.2 Access to the Lock Box and Ignition Key

The card, in conjunction with a PIN number, would allow access into the lock box that is installed inside the vehicle. The vehicle ignition key would be stored inside the lock box.

#### 15.3.1.3 Record Keeping for Billing

Card access to the lock box would also act as a record keeping function for customer billing. Billing, which is based on mileage and hours used, could be handled in two ways. Fees could be deducted from the value stored on the card, or fees could be billed to a subscriber's credit card account.

#### 15.3.1.4 Reservations by Phone

Cards would be used for reservations over the phone wherever the phone is properly equipped for such use.

#### 15.3.1.5 Gasoline and Car Wash Purchases by Subscribers

Gasoline and car washes purchased by the subscribers will be reimbursed by the car sharing organization since these costs are included in the mileage and hour usage fees. Subscribers would use their card to access gasoline and car wash services; however, these expenses would be billed to the car sharing organization.

### 6.III-15.4 City of Seattle "City Card"

#### 15.4.1 General Requirements

RFCS cards could be used to perform the following "City Card" functions:

##### 15.4.1.1 Community Service Component

Volunteer and community work would be rewarded at a set rate (e.g., \$10/hr.) The City would distribute Microsoft Access database compatible software to non-profit agencies where the volunteer work was performed. The agencies would send the information (by e-mail if the database isn't larger than 2 megabytes) with number of hours worked and amount of credit earned to the central processing system. Smart card readers and sales

points would be installed at each Neighborhood Service Center (i.e., a storefront office with personnel to conduct City business and address citizen inquiries). When citizens use their smart cards at Neighborhood Service Centers to pay bills, their smart card would be credited for the volunteer hours. Smart card readers may also be installed at the Zoo, Seattle Center, or the Aquarium and with participating merchants to pay all or a portion of entrance fees and/or goods and services purchased. Funds would be provided to the clearinghouse by the City (raised from foundations and private sources, or from fees paid by merchants or banks) to subsidize this program.

#### 15.4.1.2 Linkage with the Regional Fare Coordination System

The City would coordinate system design and procurement with King County and the Regional Fare Coordination contractor to tailor the Seattle Card to be compatible. The Seattle Card would have additional functions unique to the City, which would be negotiated with the RFC system contractor.

#### 15.4.1.3 Potential Linkage with Merchants and Long Distance Telephone Systems

The New York Chase/Citibank pilot, which enlisted 650 merchants, may be a model for this part of the Seattle project. Restaurants, department stores, Laundromats, vending machines and taxicabs are potential card acceptors. Each business would have a smart card reader. Some might even be replenishment stations to add more value to the cards.

#### 15.4.1.4 Potential Linkage with the Washington State Electronic Benefits Transfer System Project

The State, through the Department of Social and Health Services (DSHS) is a member of a seven state consortium developing a magnetic stripe Electronic Benefit Transfer (EBT) system through Citibank which will begin to go on-line next year. DSHS feels that within five (5) years there may be a conversion to smart card technology. At this time, most food stores that accept food stamps have debit and credit card reader equipment that can be reprogrammed to accept the new EBT Card. The Seattle Smart Card might initially contain both a chip and a magnetic stripe contact interface to link with the EBT Project. Eventually, the State might adopt the Seattle Smart Card system as the next generation EBT card with potential savings in time and research and development costs.

**6.III-15.5 Transit Oriented Development – Fare Incentives and Secured Access**

RFCS cards would be used to provide fare incentives and secured access for participants in the four (4) Transit Oriented Development pilot projects, and for future expansion of the TOD concept.