HITACHI
Hitachi Rail Italy, Spa

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A Hitachi Group Company

臺北捷運環狀線（第一階段）

機電系統工程、軌道工程、自動收費系統工程

TAIPEI CIRCULAR LINE (PHASE 1)

E&M SYSTEM, TRACK WORKS, AFC SYSTEM

CF610/CF611/CF617

附件十二

ATS 旅客需求號誌通訊介面文件

APPENDIX 12

ATS - PASSENGER INFORMATION ICD COM-SIG

台北捷運環狀線（第一階段）

TAIPEI CIRCULAR LINE（PHASE 1）

界面控制與規定文件

INTERFACE CONTROL AND DEFINITION DOCUMENT

ICDD 編號 NO COM-SIG-005 版次 REV. 03.00

DATE 6 MAR 2015

界面說明 INTERFACE DESCRIPTION

Communication Interface between ATS and CMFT for Passenger Security & Information System

參考規格章節 SPECIFICATION SECTION REFERENCED	關聯分包商 SUBCONTRACTORS AFFECTED	關聯子系統 SUBSYSTEMS AFFECTED
PTS 1.9.2, 2.2.4(1)	**MITAC**	**Signalling CMFT**

界面細部功能說明 DETAILED FUNCTIONAL DESCRIPITON OF THE INTERFACE

The interface between the ATS and the CMFT will be an Ethernet connection using TCP/IP protocol.

界面細部技術需求 DETAILED TECHNICAL REQUIREMENTS OF THE INTERFACE

For the Passenger Security & Information System operation, message protocol and message definitions are provided for communication between the ATS and CMFT.

界面實際細部需求 DETAILED PHYSICAL REQUIREMENTS OF THE INTERFACE

(必要時使用附件)（Use attachments if necessary）

必要行動 Action Required	承辦者 Responsible Party	完成日期 Completion Date
SIG provides information to define this interface	**K. W. Clawson**	

最終界面（簽名）FINAL INTERFACE DEFINITON (SIGNATURES)

主工程師 1 (要求者)： Lead Engineer 1 (Inquirer) Dario Quirici / Keith W. Clawson	界面分包商 1： Interfaced Subcontractor 1 N/A
主工程師 2 (提供者)： Lead Engineer 2 (Provider) Leslie Liao	界面分包商 2： Interfaced Subcontractor 2 MITAC
SI 主工程師： System Integration Lead Engineer Eufemia A. Citro / Roberto Errico	日期： Date:

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1 INTERFACE DEFINITION

1.1 GENERAL INFORMATION

There will be no direct interfaces between the ATS system and the Passenger Information System. The CMFT system manages all the associated functionalities described in this document.

1.2 INTERFACE OVERVIEW

The interface between Central ATS and central CMFT uses the TCP/IP protocol. An iterative server scheme with the CMFT as the server and the Central ATS as the client will be established. Formatted messages (subsequently described) will be passed through the established connections.

Figure 1– ATS/CMFT Central Interface

The types of messages passed between Central ATS and CMFT are discussed below. The formats for these messages are described in Section 3.1 and Section 3.1.10. Information will be sent to the CMFT and received from the CMFT on an event-driven basis.

When defining an interface between computers, the communication protocol layering model can be used to simplify the description of how the communication protocol implementations are selected. The ISO/OSI reference model divides communication protocols into seven layers.

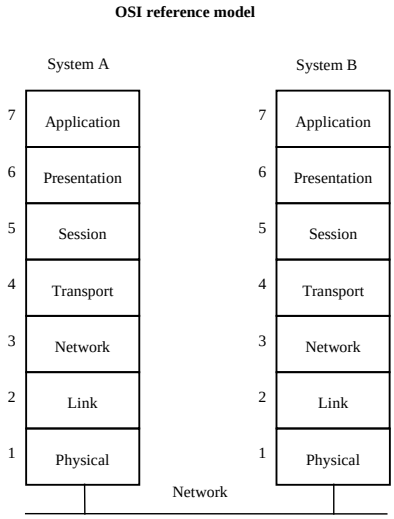

Figure 2– The ISO/OSI Reference Model

For the purposes of this document, communication protocols can be divided into two major classes:

- Low-level protocols: related to network communication (OSI layers 1 to 4)
- High-level protocols: related to application communication (OSI layers 5 to 7)

1.3 LOW-LEVEL PROTOCOLS

The suite of protocols shown in Figure 3 will be used for the low-level protocols at the control center. Particularly:

- for level 1-2 IEEE 802.3u technology will be used
- for level 3-4 TCP/IP protocols will be used

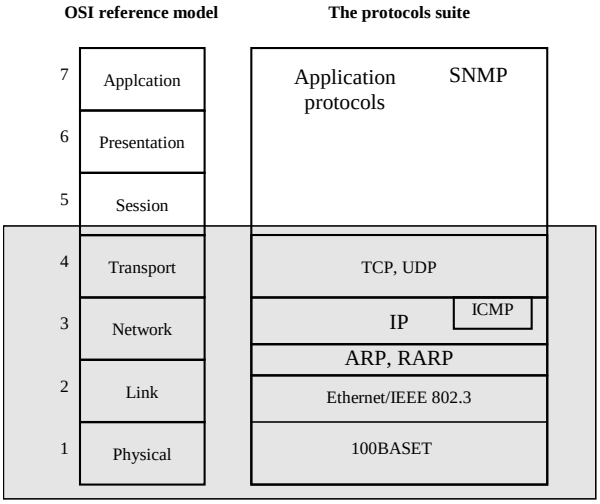

Figure 3– The Low-Level Protocol Suite

1.4 HIGH-LEVEL PROTOCOLS

Data exchange between ATS and CMFT will take place using a message passing system. The goal of the message passing system will be to provide a method by which structured information may be exchanged between two or more running processes. A message passing protocol defines rules about message structure and information content, but it does not deal with message transfer. The message transfer will be in charge of the low- level protocols chosen (e.g., TCP/IP).

Message exchange between ATS and CMFT foresees notification sent back to acknowledge the receipt of the message.

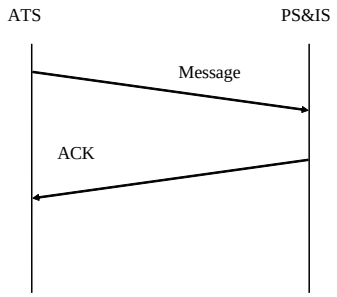

Figure 4– The Message Passing Scheme

1.5 MESSAGES

A message will be simply a delimited string of bytes. From the logical point of view, the message consists of two parts, a header and a data section.

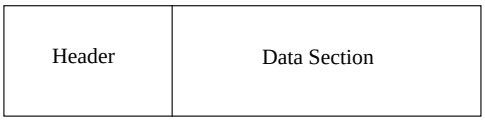

Figure 5– The Message Structure

The header will be used to describe the attributes of the information contained in the data section. The fundamental attribute of a message will be the class of the message, representing the type of information contained within the message. The message header will be required, but the data section is optional. Most control messages consist only of a message header.

The data section is best thought of as a stream of elements. Each element will be generally a primitive data type such as a character or integer. The data section size, the number of bytes sent or received at one time, is not fixed and may differ between types of messages.

1.5.1 CENTRAL ATS TO CMFT

Central ATS sends the messages identified in Table 1 to the CMFT system. Section 3.1 describes the parameters and formats for each of these messages.

Table 1 Central ATS to CMFT Message Types

Message Type	Message Name	Message Description
A	TRAIN INFORMATION	Information about all the trains currently in the system.
B	PLATFORM INFORMATION	Information about all of the platforms in the system.

Message Type	Message Name	Message Description
C	TRAIN BERTHING ERROR	The train [PVID] has experienced a berthing error, either the train has overshot the station and re-berthing is in progress or the train will not attempt to re-berth. This message will be sent every time a train berthing error occurs
E	TRAIN ARRIVING AT PLATFORM	The train [PVID] has entered the track section before [relative to the direction of motion] a platform.
F	TRAIN LEAVING PLATFORM	The train [PVID] is leaving the platform. This will be determined by two conditions both being true: a. Doors closed and locked indication b. Train does not have a hold placed on it.
G	ACKNOWLEDGE MESSAGE	Acknowledge that the previously sent message was received.
H	HEALTH CHECK MESSAGE	Sent periodically to see if CMFT is alive and reachable.
M	PLATFORM ALARM INFORMATION	A message containing alarm information for a station.
N	TRAIN LOCATION MESSAGE	A message containing the location of each train.
O	CCTV ACTIVATION MESSAGE	A message containing various abnormal conditions on the train used for activating the CCTV.

1.5.2 CMFT TO CENTRAL ATS

The CMFT system sends the messages identified in Table 2 to the Central ATS system. Section 3.2 describes the parameters and formats for each of these messages.

Table 2 CMFT to Central ATS Message Types

Message Type	Message Name	Message Description
E	TRAIN UPDATE REQUEST	Request a Train Information message to be sent.
F	ACKNOWLEDGE MESSAGE	Acknowledge that the previously sent message was received.

Message Type	Message Name	Message Description
G	PLATFORM UPDATE REQUEST	Request a Platform Information message to be sent.

2 PROTOCOL MANAGEMENT

This section defines the protocol rules.

2.1 CONNECTION AND FAILOVER MANAGEMENT

The iterative server scheme with failover between the CMFT (server) and the Central ATS (client) is described below.

The CMFT servers will have one common virtual TCP/IP address that the Central ATS will use. The online Central ATS client will attempt to open a socket (dynamically assigned at run time) that will bind to the virtual TCP/IP address on the CMFT. If the CMFT accepts the connection, this will establish the desired two-way communications between the online CMFT server and online Central ATS client.

If either the online CMFT server or the online Central ATS client fails, the socket connection will be broken and an alarm will be generated on both sides (ATS and CMFT) to inform the operators about the failure. If the CMFT server failed, the current online Central ATS client will begin the normal connection process until the current online CMFT server accepts the connection. If the Central ATS client failed, the standby ATS client will become online and will begin the normal connection process until the online CMFT server accepts the connection.

2.2 MESSAGES TRIGGERING

Messages will be sent on an event-driven basis.

The Vehicle Regulation (VR) function of the Central ATS system continually generates a system plan of all vehicle arrivals/departures. The departure times displayed at each Platform Information display will be the departure times from this system plan. Changes to the system plan will cause new messages to be sent.

This plan will be continually produced at various times while trains are at platforms and between stations. Due to individual vehicle performances varying from one vehicle to another and timing of indications seen by the Central System varying, minor differences will occur in the times displayed.

In instances while the train is finishing its dwell at a platform, a new plan can be finishing. At this point the train and the central office perform as concurrent systems. Concurrency will be when two or more execution flows will be able to run simultaneously with each system independently performing its own execution flow. The concurrency here will be that the vehicle is counting down the dwell and Central is re-planning. In rare circumstances where Central has just completed a re-plan and transmitting that plan to CMFT at approximately the same time that central is transmitting to CMFT the train is already departing, this could cause the passenger information signage to be misleading by displaying the new planned departure

time for a train that has just departed. The next re-plan will resolve this issue at the next station.

However, the CMFT must recognize and handle this possibility. Each time the CMFT removes a train/destination/ETD from a PID based on a departure message, it must save the train ID & destination, and ETD. If the CMFT then receives a new plan with the first train having the same train ID & destination, and the ETD is within a reasonable window, the CMFT must resend the departure message.

2.3 TIMING

Before sending a message, ATS and CMFT must wait for the acknowledgement of the previous message. CMFT's responsibility for holding the previous message context ends when either acknowledgement is received or a configurable time out (e.g. 15 seconds) is reached. ATS will be responsible for connection establishment, monitoring the health of the current connection, and re-establishing a viable connection when needed as described in the following sections. Under certain circumstances, if ATS does not receive an acknowledgement to the previous message before a configurable time out is reached, the ATS will consider the connection is down and shall initiate failover procedure.

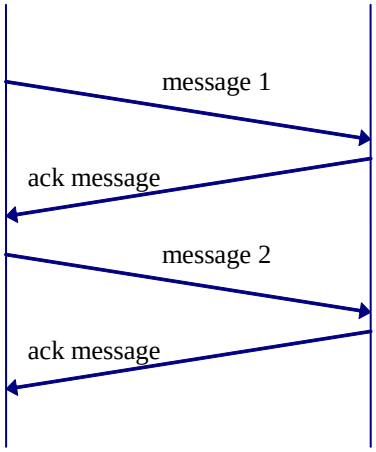

Figure 6– Messages Sent in a Normal Sequence

2.4 APPLICATION MESSAGE RETRANSMISSION

Messages will never be re-sent.

2.5 TIME SYNCHRONIZATION

This interface uses the Network Time Protocol (NTP). The Clock that will provide the time will be connected via the CMFT network. The Central ATS computers will function as NTP clients. For more information see RFC-1129 Internet Time Synchronization: The Network Time Protocol Specification and RFC-1305 Network Time Protocol (Version 3) Specification, Implementation.

3 MESSAGE FORMATS

This section describes the application message formats for the Central ATS to CMFT and CMFT to Central ATS interfaces. All application messages will be preceded by a 2-byte binary word containing the length of the application message and a 14 byte Timestamp at which is the time of the message generated by the sender.

Table 3: Header

Field	Bytes	Description
Msg length	2 bytes	Message Length (2 byte integer) The value is calculated by total number of bytes beyond this field.
Timestamp	14 bytes	GMT timestamp indicates the date-and time when the message was transmitted. It includes seven fields of two bytes each indicating the years, months, days, hours, minutes, seconds, and hundredths of a second. These fields are defined below. • The years field must be an unsigned integer with a value of between 0 and 65535 • The months field must be an unsigned integer with a value of between 1 and 12 inclusive (1=January, etc.) • The days field must be an unsigned integer with a value of between 1 and 31 inclusive • The hours field must be an unsigned integer with a value of between 0 and 23 inclusive • The minutes field must be an unsigned integer with a value of between 0 and 59 inclusive • The seconds field must be an unsigned integer with a value of between 0 and 59 inclusive • The hundredths of a second field must be an unsigned integer with a value of between 0 and 99 inclusive
Msg Type	1 byte	Message Type (1 ASCII character)

Each application message will have a 1-byte message type immediately following the length and timestamp fields. The minimum application message length will be 17 bytes. For all

multi-byte integer message fields, the lowest-order byte will be in the first byte of the field and the highest-order byte will be in the last byte of the field, i.e. little-endian byte order.

Table 4 lists the Station ID conventions used in the message formatting within this section. Each station platform/location has a three-character Station ID or abbreviation. This abbreviation will be used as the station identifier for all messages. When the number of characters in the Station ID is less than three characters, the Station ID characters will be left justified and will have one or more spaces (ASCII code 32) at the right to pad the field into a three-character Station ID. The underscore in the below table signifies a space.

Table 4 Station IDs

Station ID	Station Name
Y6_	Dapinglin
Y7_	Shisizhang
Y8_	Xiulang Bridge
Y9_	Jingping
Y10	Jingan
Y11	Zhonghe
Y12	Qiaohe
Y13	Zhongyuan
Y14	Banxin
Y15	Banqiao
Y16	Xinpu Minsheng
Y17	Touqianzhuang
Y18	Xinfu
Y19	New Taipei Industrial Park
DPT	Depot
TT_	Test Track

3.1 CENTRAL ATS TO CMFT MESSAGES

The messages to be sent from Central ATS to CMFT, as outlined in Section 1.5.1, are described in greater detail in the following sections.

3.1.1 TRAIN INFORMATION

The Train Information message will be sent to CMFT to provide the status of all trains active in the system. This message will be sent when the information content changes. Table 5 contains the format of the Train Information message being sent from Central ATS to CMFT.

Table 5 Train Information Message

Field	Bytes	Description
Msg Length	2 bytes	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (A)	Message Type (A = Train Information message [1 ASCII character])
Repeat for Each Active Train (Train Information data) - The set of characters will contain a series of lines (separated by carriage-returns), one line for each train active in the system. Tab characters will separate the fields for each line (train). The following fields are in the order in which they appear.		
Train PVID	3 bytes	Length: 3 characters Values: Three characters representing a valid Permanent Vehicle ID in the system. PVID is numeric for passenger service vehicles and alphanumeric (First character must be alpha character) for service vehicles.
Tab	1 byte	
Train TID	3 bytes	Length: 3 characters Values: Any three characters representing a valid Train Tracking ID in the system. Updated: Anytime the TID has changed.
Tab	1 byte	
Train VR Control	1 byte	Length: 1 character Values: “Y” or “N” Vehicle Regulation (VR) controlled status provides an indication on the reliability of the data associated with the vehicle. If the vehicle is not controlled by VR then the vehicle will be controlled manually. Under manual control the train can change direction, depart early, dwell longer, or stop. The ATS system will provide whatever information is available. Cases: • “Y” if the vehicle is under the control of the Vehicle Regulation task of Central ATS. • “N” if the vehicle is not under the control of the Vehicle Regulation task of Central ATS.

Field	Bytes	Description
		Updated: Anytime the control of the train changes.
Tab	1 byte	
Hold Train Status	1 byte	Length: 1 character Values: “Y”, “N” Cases: • “Y” if the vehicle has a hold placed on it. • “N” if the vehicle does not have a hold placed on it. Updated: Anytime the status changes.
Tab	1 byte	
Dead Train Status	1 byte	Length: 1 character Values: “Y”, “N” The Dead Train status provides an indication that the train is not responding to any commands form ATS Central and will have to be rescued. Cases: • “Y” if the vehicle has been declared dead. • “N” if the vehicle has not been declared dead. Updated: Anytime the status changes. Note: Dead Train shall be defined as the train that either fails to move after waiting a predefined time after the vehicle doors were commanded to close at a platform ("vehicle did not depart as expected" alarm) or the train generates an "unintended stop" indication ("vehicle stranded due to unintended stop" alarm).
Tab	1 byte	
Train Dwell Extended Status	1 byte	Length: 1 character Values: “Y”, “N” Cases: • “Y” if the vehicle dwell extended due to something ahead. • “N” if the vehicle dwell has not been extended. Updated: Anytime the status changes.
Tab	1 byte	

Field	Bytes	Description
Rescue Train	1 byte	Length: 1 character Values: “R” or “N” Cases: • “R” if the train has been designated as a rescue train. • “N” if train has not been designated as a rescue train. Updated: Anytime the train’s rescue designation changes. NOTE: Operational procedure will be to change the failed train’s DID to be non-revenue train with no stops and not picking up any passengers. Both failed train and the rescue train will show up in each platform’s report as non-revenue and not stopping or loading.
Tab	1 byte	
Train Sleep Mode Status	1 byte	Length: 1 character Values: “Y”, “N” The Sleep Mode status provides an indication that the train has been parked and shut down. Cases: • “Y” if the vehicle is in sleep mode • “N” if the vehicle is not in sleep mode. Updated: Anytime the status changes.
Carriage Return	1 byte	

3.1.2 PLATFORM INFORMATION

The Platform Information message will be sent to CMFT to provide the status of all platforms in the system. This message will be sent when the contents change, or if no contents change then it will be sent at least once every 30 seconds under normal conditions. Minimum time constraints (if any) between transmissions due to the large message length will be determined during implementation. Table 6 contains the format of the Platform Information message being sent from Central ATS to CMFT.

Note: If a train is being driven manually, the arrival and departure times sent by the ATS may not reflect the actual arrival and departure times of the train.

Table 6 Platform Information Message

Field	Bytes	Description
Msg Length	2 bytes	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (B)	Message Type (B = Platform Information message [1 ASCII character])
Repeat for Each Platform (Platform Information Data) - The set of characters will contain a series of lines (separated by carriage-returns) containing the necessary platform information. The file format will have multiple sections. The keyword “PLATFORM” will divide each section.		
PLATFORM Separator	8 bytes	The keyword “PLATFORM” will divide each section.
Carriage Return	1 byte	
Platform ID	4 bytes	An agreed upon text string that represents a particular platform. This string will be a concatenation of the Station ID defined in Table 4 and a number. This number will be either “1” or “2”. “1” will represent the Track 1 Platform and “2” will represent the Track 2 Platform. An example would be Y9_2 that means the Y9 station, Track 2.
Carriage Return	1 byte	
Status	4 - 15 bytes	A text string representing the status of the platform. The possible values are “Open” or “Closed” or “Single Tracking”
Carriage Return	1 byte	
Repeat for Each Train That Will Stop at the Platform in the Next 20 Minutes (Train Information Data) - After the “Status” line, a variable number of lines, with each line representing one vehicle, will appear. The list will only include trains that are predicted to arrive at the station within the next 20 minutes. If no train will be arriving in the next 20 minutes, the arrival time of the next train will be sent. A tab character separates the fields in each line. The lines will be sorted by arrival order.		
Train PVID	3 bytes	Length: 3 characters Values: Three characters representing a valid Permanent Vehicle ID in the system.

Field	Bytes	Description
		PVID for passenger service vehicles will be numeric and alphanumeric (First character must be alpha character) for service vehicles.
Tab	1 byte	
Train Arrival	6 bytes	The arrival time of the vehicle at the platform Length: 6 characters Values: Any valid time in 24-hour format. All times will be those of the current time zone. The time will appear as HHMMSS. Examples are 013959 (for 39 minutes 59 seconds past 1 am) and 235959 (for one second before midnight.) Updated: Anytime that the Vehicle Regulation task predicts a new arrival time or that the schedule changes.
Tab	1 byte	
Train Departure	6 bytes	The departure time of the vehicle at the platform Length: 6 characters Values: Any valid time in 24-hour format. All times will be those of the current time zone. The time will appear as HHMMSS. Examples are 013959 (for 39 minutes 59 seconds past 1 am) and 235959 (for one second before midnight.) Updated: Anytime that the Vehicle Regulation task predicts a new departure time or that the schedule changes. NOTE: After a train departs a station, the platform message will be updated and sent with recently departed trains deleted out of the departed platform's list.
Tab	1 byte	
Train Run ID	3 bytes	The Run Identifier of the train when it leaves the platform. This field is reserved for future use; it can be used to identify different service runs (which are particularly useful when there is a bifurcation, but can be used for different service runs as well). Length: 3 ASCII characters, which will consist of '000' until designated run identifiers are necessary. Updated: Anytime that the Run Identifier changes for that train at that platform.

Field	Bytes	Description
Tab	1 byte	
Train Stopping	1 byte	Whether Vehicle Regulation knows if the train will be stopping at the platform. At least three trains that will be stopping will be listed for each platform (assuming that a schedule exists which has that many stopping trains for that platform). Length: 1 character Values: “Y” or “N” Cases: • “Y” if the train will be stopping. • “N” if the train will not be stopping. Updated: Anytime that the knowledge of whether the train will be stopping changes.
Tab	1 byte	
Train Accurate	1 byte	The accuracy of the arrival and departure times. Length: 1 character Values: “Y” or “N” The Accurate status provides an indication to the reliability of the times. When VR estimates the arrival and departure time, the times will be the most accurate if the train is within two stations of the stopping locations. VR will continue to predict the arrival and departure times beyond two stations but the times will not be as accurate. Cases: • “Y” if the time given for arrival and departure will be the most accurate planned projection by Vehicle Regulation of station arrival/departures within the next two stations. • “N” if the time given for arrival and departure will be only a predicted time by Vehicle Regulation further than 2 stations away up to a maximum of 20 minutes away. Updated: Anytime that the knowledge of arrival or departure times change.
Tab	1 byte	

Field	Bytes	Description
Train Loading	1 byte	Whether Vehicle Regulation knows if the train will be loading passengers or if it will be strictly unloading. Length: 1 character Values: “Y” or “N” Cases: • “Y” if the train will be loading passengers. • “N” if the train will not be loading passengers. Updated: Anytime that the knowledge of whether passengers will be loaded on the train changes.
Tab	1 byte	
Train Direction	1 byte	Length: 1 character Values: “0”, “1” or “2” Cases: • “0” if the train’s direction is indeterminate. • “1” if the train’s direction is right to left. • “2” if the train direction is left to right. Updated: Anytime that the train’s direction changes.
Tab	1 byte	
Last Train on Track 1	1 byte	Length: 1 character Values: “Y”, “N” The Last Train on Track 1 indicates if this train will be the last one on Track 1 for passenger operation. Cases: • “Y” if the vehicle is the last train carrying passengers • “N” if the vehicle is not the last train carrying passengers. Updated: Anytime the status changes.
Tab	1 byte	

Field	Bytes	Description
Last Train on Track 2	1 byte	Length: 1 character Values: “Y”, “N” The Last Train on Track 2 indicates if this train will be the last one on Track 2 for passenger operation. Cases: • “Y” if the vehicle is the last train carrying passengers • “N” if the vehicle is not the last train carrying passengers. Updated: Anytime the status changes.
Tab	1 byte	
Train Platform	3 bytes	A text string that represents a particular final destination platform. This string will be the Station ID defined in Table 4.
Carriage Return	1 byte	
Terminus Platform	1 byte	Length: 1 character Values: “Y”, “N” The Terminus Platform indicates if this station is a terminus station. Cases: • “Y” if the station is a terminus station • “N” if the station is not a terminus station Updated: Anytime the status changes.
Carriage Return	1 byte	

3.1.3 TRAIN BERTHING ERROR

The Train Berthing Error message gives an indication for a train (PVID) that a berthing error has occurred. Table 7 contains the format of the Train Berthing Error message being sent from Central ATS to the CMFT.

Table 7 Train Berthing Error Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 9)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (C)	Message Type (C = Train Berthing Error message) (1 ASCII character [1 byte])
PVID	3 bytes	Permanent Vehicle ID (3 ASCII characters [3 bytes]) – Valid PVID entries run from 001 to 099, depending on the actual number of vehicles.
Station ID	3 bytes	The station ID as defined in Table 4 (3 ASCII characters [3 bytes])
Platform ID	1 byte	"1"or "2" representing the track number of the platform (1 ASCII character [1 byte]) • "1" is the UP track • "2" is the DOWN track
Berthing Error	1 byte	1 ASCII character [1 byte]) as defined below: 1. Under/Overshoot of station – will attempt re-berth 2. (Under/Overshoot of station – will not attempt re-berth) OR (Re-berth failed (regardless of Under/Overshoot))

3.1.4 TRAIN ARRIVING AT PLATFORM

The Train Arriving at Platform message will be sent to the CMFT to indicate that a train with the given PVID has entered the track section before (relative to the direction of travel) a platform. Table 8 contains the format of the Train Arriving at Platform message being sent from Central ATS to the CMFT.

Table 8 Train Arriving at Platform Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 8)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (E)	Message Type (E = Train Arriving at Platform) (1 ASCII character [1 byte])

Field	Bytes	Description
PVID	3 bytes	Permanent Vehicle ID (3 ASCII characters [3 bytes]) – Valid PVID entries run from 001 to 099, depending on the actual number of vehicles.
Station ID	3 bytes	The station ID as defined in Table 4 (3 ASCII characters [3 bytes])
Platform ID	1 byte	“1”or “2” representing the track number of the platform (1 ASCII character [1 byte]) • “1” is the UP track • “2” is the DOWN track

3.1.5 TRAIN LEAVING PLATFORM

The Train Leaving Platform message will be sent to CMFT to indicate that a train with the given PVID is about to leave a platform. There will be two cases when ATS sends this information, for trains stopping at a station and for non-stop trains.

For trains expecting to stop, this information will be based on two conditions being true:

1. the doors are closed and the locked indication has been received
2. the train does not have a hold placed on it

For non-stop trains, the track occupancy leaving the station will also trigger this message. If a train was expected to stop but the track occupancy occurs, the "train leaving" message will be delayed for 5 seconds to see if a train overshoot has occurred.

Table 9 contains the format of the Train Leaving Platform message being sent from Central ATS to CMFT.

Table 9 Train Leaving Platform Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 8)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (F)	Message Type (F = Train Leaving Platform) (1 ASCII character [1 byte])
PVID	3 bytes	Permanent Vehicle ID (3 ASCII characters [3 bytes]) – Valid PVID entries run from 001 to 099, depending on the actual number of vehicles.

Field	Bytes	Description
Station ID	3 bytes	The station ID as defined in Table 4 (3 ASCII characters [3 bytes])
Platform ID	1 byte	“1”or “2” representing the track number of the platform (1 ASCII character [1 byte]) • “1” is the UP track • “2” is the DOWN track

3.1.6 ACKNOWLEDGE MESSAGE

The Acknowledge Message will be sent from Central ATS to CMFT to acknowledge that a message from CMFT has been received. Central ATS must send this message for each message received from CMFT, with the exception of the Acknowledge Message itself (type F from CMFT). Table 10 shows the format of this message.

Table 10 Acknowledge Message

Field	Bytes	Description
Msg length	2 bytes (Value = 2)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (G)	Message Type (G = Acknowledge Message) (1 ASCII character [1 byte])
Status	1 byte	“0” = Data from previous message was valid “1” = Data from previous message was invalid (1 ASCII character [1 byte])

3.1.7 HEALTH CHECK

This message will be sent to CMFT periodically to determine if it is alive and reachable. Upon receipt of this message, CMFT must reply by sending the Acknowledge Message (type F) back to Central ATS. This message will not be sent to CMFT more frequently than once per second. Table 11 shows the format of this message.

Table 11 Health Check Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 1)	Message Length (2 byte integer)

Field	Bytes	Description
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (H)	Message Type (H = Health Check Message) (1 ASCII character [1 byte])

3.1.8 PLATFORM ALARM INFORMATION

The Platform Alarm message is sent to CMFT to provide the alarm status of each platform in the system. Upon establishment of communications with CMFT, this message will be sent for each platform to provide the current data state. Once that initialization is complete, this message is event driven and only sent when the contents change.

The format of the Platform Information message being sent from Central ATC to CMFT is shown in Table 12.

Table 12 Platform Alarm Message

Field	Bytes	Description
Msg length	2 bytes (Value = 17)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (M)	Message Type (M = Platform Alarm Message) (1 ASCII character [1 byte])
Station ID	3 bytes	The station ID as defined in Table 4 (3 ASCII characters [3 bytes])
Platform ID	1 byte	"1"or "2" representing the track number of the platform (1 ASCII character [1 byte]) • "1" is the UP track • "2" is the DOWN track
PSDS Door 1 Obstruction Status	1 byte	"0" representing no active alarm condition "1" representing an active door 1 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 2 Obstruction Status	1 byte	"0" representing no active alarm condition "1" representing an active door 2 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 3 Obstruction Status	1 byte	"0" representing no active alarm condition "1" representing an active door 3 obstruction alarm condition (1 ASCII character [1 byte])

Field	Bytes	Description
PSDS Door 4 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 4 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 5 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 5 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 6 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 6 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 7 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 7 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 8 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 8 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 9 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 9 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 10 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 10 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 11 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 11 obstruction alarm condition (1 ASCII character [1 byte])
PSDS Door 12 Obstruction Status	1 byte	“0” representing no active alarm condition “1” representing an active door 12 obstruction alarm condition (1 ASCII character [1 byte])

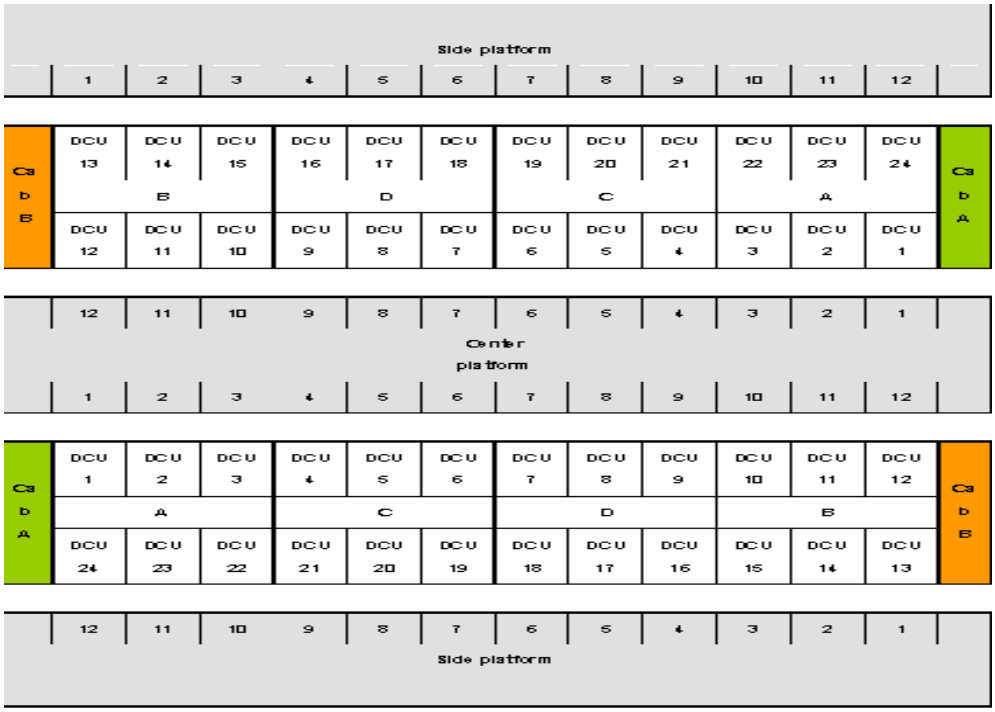

Figure 7- Platform Screen Door Orientation

3.1.9 TRAIN LOCATION

This message type provides transmission of 'Train Location Message' from Central ATS to the CMFT. The Central ATS receives the train location information from a separate communication interface to the Carborne Controller (CC) through the FrontAM equipment. This message will be transmitted on a continuous basis with the transmission cycle to be determined during design. This message will not be an event driven message.

For more information on the train location data, refer to document C71_D403, CBTC - ATS External Interface Specification. For the Taipei Circle Line system map, refer to document TC1-22200, SIG-DDR - Scheme Plan.

Field	Bytes	Description
Msg Length	2 bytes	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 bytes (N)	Message Type (N = Train Location Message) (1 ASCII character)
PVID 1	3 bytes	Permanent Vehicle ID (3 ASCII characters (3 bytes))
TID 1	3 bytes	Tracking ID (3 ASCII characters (3 bytes))
Train Location 1	12 Bytes	Train location as received from the FrontAM interface, format shall be: • Front Location of Train (Segment ID) (4 bytes)

Field	Bytes	Description
		• Front Location of Train (Offset on segment in half meter) (2 bytes) • Rear Location of Train (Segment ID) (4 bytes) • Rear Location of Train (Offset on segment in half meter) (2 bytes)
Occupied Track Circuit 1	4 bytes	Train location determined by track circuit occupancy (4 ASCII characters (4 bytes)).
PVID 2	3 bytes	Permanent Vehicle ID (3 ASCII characters (3 bytes))
TID 2	3 bytes	Tracking ID (3 ASCII characters (3 bytes))
Train Location 2	12 Bytes	Train location as received from the FrontAM interface, format shall be: • Front Location of Train (Segment ID) (4 bytes) • Front Location of Train (Offset on segment in half meter) (2 bytes) • Rear Location of Train (Segment ID) (4 bytes) • Rear Location of Train (Offset on segment in half meter) (2 bytes)
Occupied Track Circuit 2	4 bytes	Train location determined by track circuit occupancy (4 ASCII characters (4 bytes)).
• • •	• • •	• • •
PVID N	3 bytes	Permanent Vehicle ID (3 ASCII characters (3 bytes))
TID N	3 bytes	Tracking ID (3 ASCII characters (3 bytes))
Train Location N	12 Bytes	Train location as received from the FrontAM interface, format shall be: • Front Location of Train (Segment ID) (4 bytes) • Front Location of Train (Offset on segment in half meter) (2 bytes) • Rear Location of Train (Segment ID) (4 bytes) • Rear Location of Train (Offset on segment in half meter) (2 bytes)
Occupied Track Circuit N	4 bytes	Train location determined by track circuit occupancy (4 ASCII characters (4 bytes)).

Table 13 Train Location Message

3.1.10 CCTV ACTIVATION MESSAGE

Certain abnormal conditions or alarms on a train will trigger CCTVs on the train. ATS processes vehicle states from SCADA and FrontAM, sorts and combines abnormal conditions, and notifies CMFT to activate CCTV. This message will be sent when the information content changes.

Some abnormal conditions are for the entire train, some are for a certain car, and some are for a certain door. The train alarm message is defined to represent any of these conditions.

Field	Bytes	Description
Msg Length	2 bytes (value = 10)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (O)	Message Type (O = Train Alarm Message) (1 ASCII character)
PVID	3 bytes	Permanent Vehicle ID (3 ASCII characters (3 bytes))
Car ID	1 byte	The car identification (ASCII value: A, B, C, or D, space if unknown or not applicable. (1 ASCII character)
Door ID	3 bytes	The door identification (ASCII value, R01-R12, L01-L12, or spaces if unknown or not applicable). (3 ASCII characters (3 bytes))
Alarm Type	1 byte	The alarm type (numeric value). Refer to Table 15 for possible alarm types. (1 byte integer)
Alarm State	1 byte	“0” representing no active alarm condition “1” representing an active alarm condition (1 ASCII character [1 byte])

Table 14: Train Alarm Message

In the following table, a list of possible alarm types is provided. The number in the ID Type column is used for the data for the Alarm Type in Message ‘O’.

ID Type	Abnormal Conditions	Notes
1	Unintended Stop between Stations	Information is from FrontAM message 101 for train zero speed and in station. This does not include overshoot or undershoot at a platform

ID Type	Abnormal Conditions	Notes
2	Fire Detection on Board	This is either internal/roof or external/under frame fire alarms from SCADA train data for a car A, B, C or D. Also includes the internal or external fire alarms from FrontAM for cars 1, 2, 3 and 4 which will correspond with cars A, B, C and D, respectively
3	EED Pulled	From the SCADA train data for the emergency handle
4	Abnormal Door Opening	From the SCADA train data for the unexpected door open (entire train)
5	CC Failure	Information is from FrontAM message 10. Depends on single CC or dual CC
6	DIH/DEH Pulled	From the SCADA train data for the emergency door release (internal or external)
7	Vehicle Door Obstructed	From the SCADA train data for door obstruction
8	Obstacle Detector Activated	From FrontAM message 170
9	Derailment Detector Activated	From FrontAM message 170 and from the SCADA train data (derailment A or B)

Table 15: Train Alarm Types

3.2 CMFT TO CENTRAL ATS MESSAGES

The messages to be sent from CMFT to Central ATS, as outlined in Section 1.5.2, are described in greater detail in the following sections.

3.2.1 TRAIN UPDATE REQUEST

This message will be sent to Central ATS when CMFT needs a new Train Information message to be produced. Central ATS will respond with a Train Information message. This message should be sent only when CMFT has suffered a major failure and lost all existing information. Table 16 shows the format of this message.

Table 16 Train Update Request Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 1)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (E)	Message Type (E = Train update request message) (1 ASCII character [1 byte])

3.2.2 ACKNOWLEDGE MESSAGE

This message will be sent to Central ATS from CMFT to acknowledge messages received from Central ATS. CMFT must send this message for each message received from Central ATS with the exception of the Acknowledge Message itself (type G from Central ATS). Table 17 shows the format of this message.

Table 17 Acknowledge Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 2)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (F)	Message Type (F = Acknowledge Message) (1 ASCII character [1 byte])
Status	1 byte	"0" = Data from previous message was valid "1" = Data from previous message was invalid (1 ASCII character [1 byte])

3.2.3 PLATFORM UPDATE REQUEST

This message will be sent to Central ATS when CMFT needs a new Platform Information message to be produced. Central ATS will respond with a Platform Information message. This message should be sent only when the CMFT has suffered a major failure and lost all existing information. Table 18 shows the format of this message.

Table 18 Platform Update Request Message

Field	Bytes	Description
Msg Length	2 bytes (Value = 1)	Message Length (2 byte integer)
Timestamp	14 bytes	GMT Timestamp. See Section 3 for format.
Msg Type	1 byte (G)	Message Type (E = Platform update request message) (1 ASCII character [1 byte])